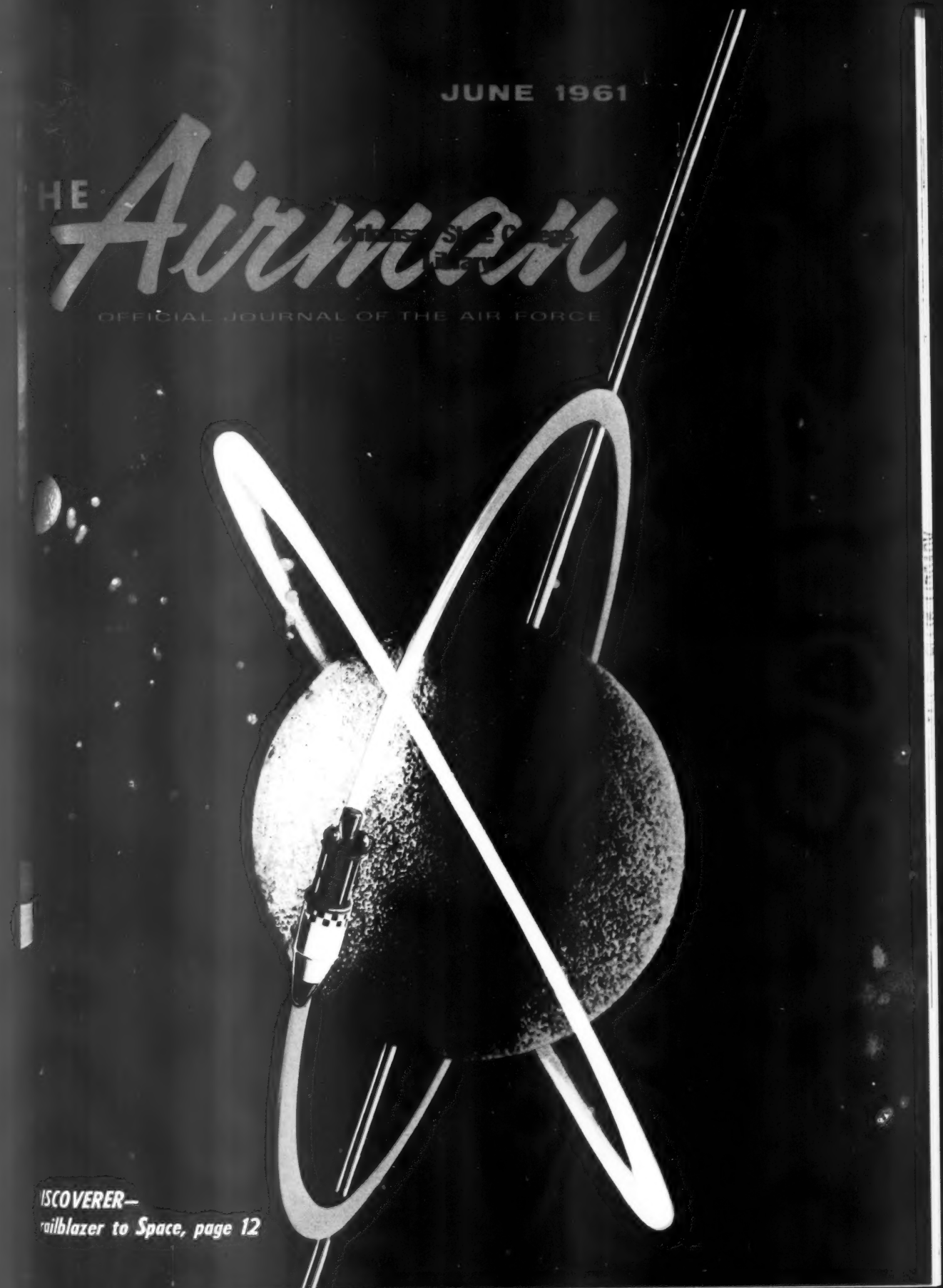
JUNE 1961

THE Airman

OFFICIAL JOURNAL OF THE AIR FORCE



DISCOVERER—
Trailblazer to Space, page 12

U.S. AIR FORCE ACADEMY

Man's flight through life
is sustained by the power of his knowledge.

THE Airman

OFFICIAL JOURNAL OF THE AIR FORCE

Volume V, Number 6 June 1961

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THE AIRMAN is primarily a medium for the exchange of ideas and information among Air Force personnel. Readers are encouraged to submit articles, short subjects, photographs, and artwork. All contributions will be given consideration; suggestions and criticisms are welcomed. Opinions expressed by individual contributors do not necessarily reflect the official viewpoint of the Department of the Air Force. All photographs are official USAF photos unless otherwise designated.

LETTERS TO THE EDITOR

A Few Bouquets . . .

Sir: I appreciated your article *What You Should Know About Auto Insurance* in the March issue. It is another of the types of fine service you are rendering to airmen and, as I said some months ago, I should like to see still more. There is one point about comprehension and collision insurance I would like to add, however. You mention that this type of insurance is usually arranged through the dealer. This is true. As a result, of course, it is also added to the purchase price before finance charges are computed, thus increasing the end cost more than the average person realizes. The insurance is also normally issued for the period of financing. Here, too, the rate for the whole period of coverage is based on the value of the car at time of purchase. Depreciation is ignored. Airmen could save themselves many insurance dollars by purchasing such insurance for one-year periods, renewing it annually at the reduced rates corresponding with the depreciated value of the car at time of renewal.

MSgt. Barclay Jones
Stony Brook AFS, Mass.

Sir: I would like to express my appreciation for the article *Counter Counterattack* in your February issue in which Sergeant Bamford describes the 8th Air Force mission commanded by my son, Brig. Gen. Frederick W. Castle. Naturally, I read it with a great deal of interest and find that many of my friends and those of my son did also. You might be interested to know that Lt. Gen. Ira Eaker (USAF, Ret.) obtained copies of the magazine and placed one before each guest at the annual Castle-Combe Group dinner which was held in February.

Col. Benjamin F. Castle
USAF, Ret.
Washington, D. C.

Sir: I would like to compliment you and your staff on the wonderful job you did on the March issue. I thought it was one of your best. I hope you continue to turn out such truly fine articles for our enjoyment.

A3C Gerald E. Johnson
APO 334, San Francisco, Calif.

(Continued on page 41)

★ ★ ★

FRONT COVER design symbolizes *Agena* satellites in orbit. Courtesy Bell Aerosystems Co.

(The Cape Canaveral

ONE END

Maj. Gen. Leighton I. Davis, Commander of the Air Force Missile Test Center, has been closely associated with the dramatic advances in aerospace technology since the early exploratory days following World War II. Prior to assuming command of AFMTC, General Davis served as Assistant Deputy Chief of Staff, Development, at Headquarters USAF.

TSGT. JOHN K. O'DOHERTY, Airman Staff

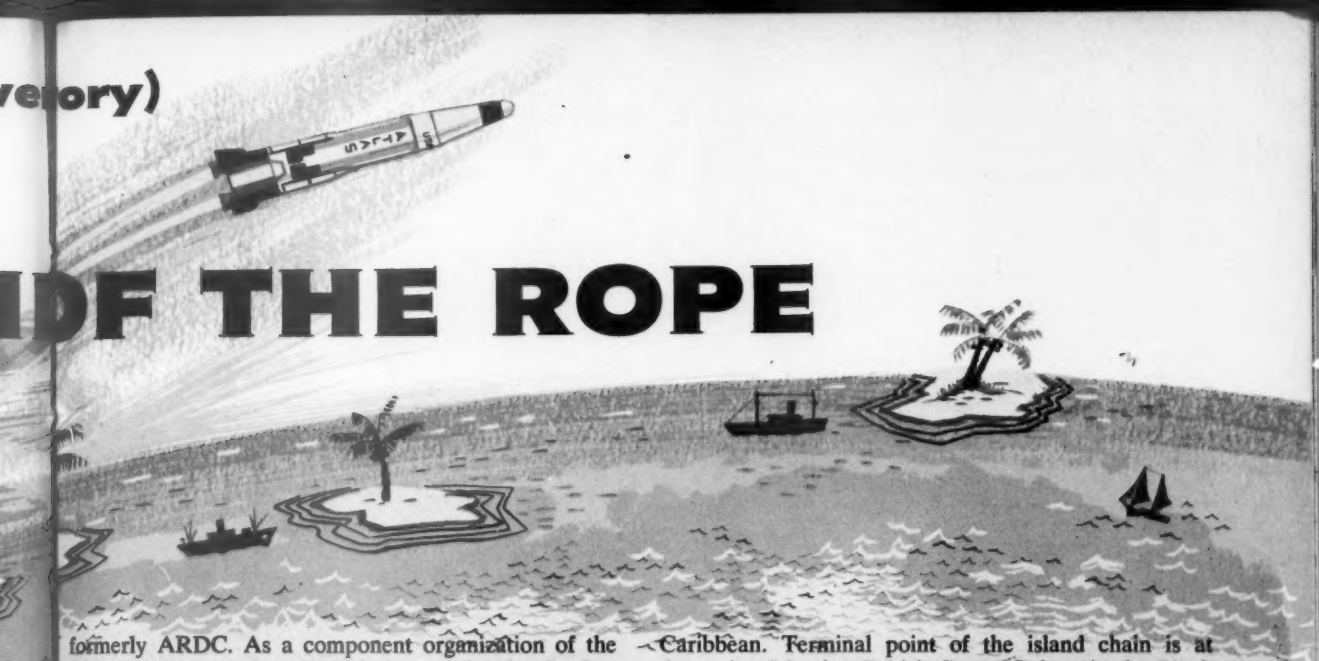
THE AIR FORCE MISSILE TEST CENTER, with headquarters at Patrick AFB, Fla., operates the Free World's most extensive laboratory for testing rockets and missiles. The operation represents an investment by the American taxpayer in the neighborhood of a billion dollars. More than 22,000 military and civilian workers take home a payroll of more than $10 million monthly. At the Technical Laboratory, just a short distance from the headquarters building, 1,000 scientists and technicians of the Data Processing Division work with $10 million worth of unbelievably sophisticated equipment, and this is but one of the functions performed by the laboratory.

These dollar figures are impressive, unquestionably, illustrating as they do the magnitude of management and responsibility involved. But equally impressive are the dividends returned by AFMTC in a little over 10 years to the American people in the form of goals attained in pursuit of national objectives.

Less than five years ago no nation on earth had ever fired an intercontinental ballistic missile. No man-made object had yet escaped the restricting force of gravity. In January of this year the 75th *Atlas* ICBM was launched in successful flight from Cape Canaveral. On February 1st the solid-fueled ICBM *Minuteman* made the most successful debut in U. S. missile history with a flight of 4,600 miles in which all primary test objectives were attained. And the encouraging results of *Project Mercury* tests during recent weeks point up the fact that an American astronaut will soon cross the momentous threshold into space. A lot of progress has been made since the first experimental missile was fired from a wooden blockhouse surrounded by sandbags at Cape Canaveral in July 1950.

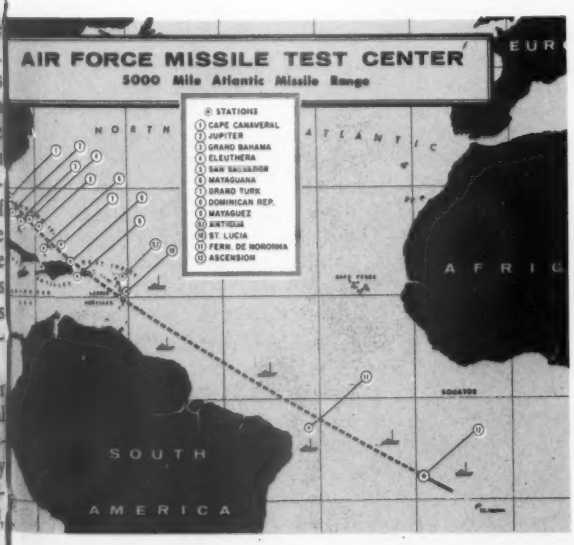
Many people have a tendency to confuse the Air Force Missile Test Center with the Cape Canaveral installation, AFMTC's most important—and most spectacular—piece of real estate. AFMTC is a military organization, one of nine major research and development centers of the Air Force Systems Command,

DF THE ROPE



formerly ARDC. As a component organization of the Systems Command, AFMTC is on the level of a numbered air force. The mission is to operate and maintain the Atlantic Missile Range, to conduct missile test flights, and collect and evaluate flight-test data for the Air Force, Army, Navy, other government agencies and civilian contractors engaged in missile development and space exploration.

The Cape Canaveral installation—more properly the Cape Canaveral Missile Test Annex—is Station Number One of the Atlantic Missile Range. Situated about 18 miles north of the headquarters at Patrick AFB, it covers an area of more than 15,000 acres of sandy scrub-land. It is from the launch complexes on the Cape that all flight tests by AFMTC are executed. Other installations integral to the Range are the tracking stations located elsewhere on the coast of Florida and on a chain of islands extending southeast across the Caribbean. Terminal point of the island chain is at Ascension Island, a British Crown Colony in the South Atlantic, 5,000 statute miles from Cape Canaveral.



The area of Cape Canaveral was selected as the site for long-range missile testing shortly after the close of World War II. The isolated location, the moderate climate, and the existence of a de-activated military base nearby each had an influence on the decision. But most important of all was the virtually unlimited over-water flight path and the strategically situated islands offering ideal tracking locations.

As a result of the lessons of World War II, airpower leaders—in particular—recognized the need for long-range missile capability for the future. Gen. Carl Spaatz, as first Chief of Staff of the Air Force, called for a vehicle that would carry a nuclear warhead a distance of 5,000 miles—the first voice raised for an ICBM and the first to specify the range he felt necessary. In the perspective of 1948, the requirement stipulated by General Spaatz had the appearance—to some—of being overly ambitious. The original goal has long since been attained and surpassed, while whole new areas of exploration have been opened up in the process.

Public Law 60 of the 81st Congress, the fruit of intense postwar study, was signed by President Truman on May 11, 1949, and the first line in the operational history of Cape Canaveral was written. The old Banana River Naval Air Station to the south was re-activated as Patrick Air Force Base, and a handful of military and civilian workers moved out to survey the sand dunes and shell banks on the Cape. The goal at that time, mid-1949, was to attain full operational status by 1953. One enthusiast of the period ventured the forecast that before too long "there may be as many as 100 long-range flights per year, and at much greater altitudes than civilian aircraft."

The pioneer band of workers at the Cape faced a number of harassing problems that have since, fortunately for their successors, been solved. Poisonous

snakes were so numerous that individual snake-bite kits were required. Effective mosquito control still lay ahead in the future. But they poured concrete for the first launch pad, a slab measuring a hundred feet square, by the spring of 1950 in preparation for the first launch in July.

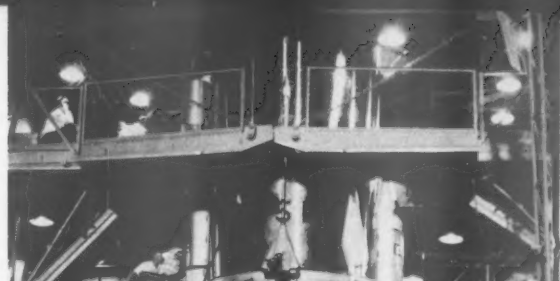
The tempo of progress picked up considerably in 1951. In May the organization was placed under jurisdiction of the Air Research and Development Command in a move to consolidate all Air Force R&D activity under a single authority. With this change the old name—Long Range Proving Ground Division—was dropped in favor of the present Air Force Missile Test Center. The first *Matador* was launched successfully in 1951, and construction was begun on the downrange tracking stations on the islands. The year 1951 was significant, too, in that it marked the departure of the last private citizen from his scrubby, unproductive holding on Cape Canaveral.

By 1954 top policy makers at the national level determined that a sufficient body of technical knowledge existed to justify proceeding with development of the *Atlas* ICBM. Because of the tremendous increase in management and operational functions thus foreseeable for the Cape, Pan American Airways Corp. and Radio Corporation of America were engaged under contract to provide broad operational and technical support to AFMTC. Both corporations continue to perform these functions to the present time.

The Cape Canaveral Missile Test Annex today bears little resemblance to the sparsely occupied waste it was just a few years ago. All the major missile contractors and subcontractors maintain field stations in space assigned to them at the Industrial Area. A number of government agencies concerned directly or indirectly with the U. S. missile/space program have their organizations on the scene. These include directorates, divisions, and liaison offices of Air Force, Army, and Navy, as well as NASA and the U. S. Coast and Geodetic Survey.

The launch complexes themselves are dispersed along the ocean front with areas generally designated by type, or families, of missiles. The tip of the Cape is devoted to cruise-type missiles such as the *Matador* and the *Mace*. Original launch facilities for these missiles are relatively uncomplicated, consisting principally of a paved area for mounting a zero-length launcher and electrical connections leading to the blockhouse. A prototype bombproof "hard site" for the *Mace* is now used for virtually all firings of this weapon.

Launch facilities for ballistic missiles, on the other hand, are far more complex. Just to the south of the light-missile area are the installations used for tests involving *Thor, Blue Scout, Pershing, Jupiter, Redstone,* and *Polaris*. It was from this area that *Explorer I,* the Free World's first earth satellite, was launched by a *Jupiter-C* on January 31, 1958. This 30.8-pound satellite, designed to measure radiation belts, is still in orbit. Later in the same year, the nation's first space probe, *Pioneer I,* was launched by an Air Force *Thor-Able*. *Pioneer I* attained an altitude of 71,300 miles on a flight of 43 hours and 12 minutes before re-entering the atmosphere. Literally dozens of other significant and fruitful tests—notably *Pioneer V* and the *Mercury-Redstone* flights—have originated from the IRBM area.



Preliminary checkout at the launch site in preparation for flight is a deliberate and painstaking examination.

The final test of the *Thor* as a weapon system took place at Cape Canaveral in December 1959. With respect to weapon systems, AFMTC is concerned primarily with testing performance in flight during development stages. As the weapon approaches operational readiness, military personnel participate closely in final stages of testing. The military or "blue suit" capability is developed to coincide with successful completion of research and flight-test programs. Both *Jupiter* and *Thor* are now deployed with operational units overseas, but the systems continue in use at AFMTC as boosters for such other scientific endeavors as *Explorer, Tiros,* and *Transit*.

The first launch of a *Polaris* test vehicle in the Navy's fleet ballistic missile program took place in January 1958 at AFMTC. In mid-1960, the *Polaris* program passed a major milestone when two missiles were launched from the submerged submarine, *USS George Washington,* off the coast. The harbor at AFMTC, Port Canaveral, can accommodate the Navy's nuclear-powered submarines which will be equipped with the *Polaris*. Realistic conditions for shore-based tests are also provided by a simulator which duplicates the motion of a ship at sea.

Just to the north of the *Thor* and *Blue Scout* complexes is the area from which the first *Minuteman* was fired. The three-stage, solid propellant ICBM success-

fully completed this 4,600-mile flight down the Atlantic Missile Range. Future tests of the *Minuteman* will include flights from hardened underground silos and from specially designed railroad cars.

Just a short distance away overlooking the ocean is ICBM row, comprising the complexes designed for the *Atlas* and *Titan*. The *Atlas* was the first U. S. ICBM, and on two occasions in 1960 successfully completed flights of about 9,000 miles. *Atlas* achieved operational status in 1959, and is now in the hands of Strategic Air Command operational units.

In addition to its merit as a weapon system, *Atlas* is considered to have great potential in space programs. Because of its effective performance in propelling heavy satellites into polar orbit and boosting instrumented probes into space, modifications of the *Atlas* are scheduled for further significant tasks in the future. The *Atlas-D* will place the first U. S. manned capsule in orbit around the earth, and initial capabilities of the *Atlas-Centaur* will include soft-landing a half-ton payload on the moon.

The *Titan,* a neighbor to the *Atlas* at AFMTC, is considerably younger in the development sense. Initial planning for *Titan* came along some considerable time after *Atlas,* but it is notable that the first successful flight test was conducted in 1959 when the vehicle was only a little over three years off the drawing board. In a full-scale test launched in February 1960, a *Titan* impacted directly into the target area 5,000 statute miles down the range. A modified *Titan II* will be used to launch *Dyna-Soar,* the nation's first piloted space craft.

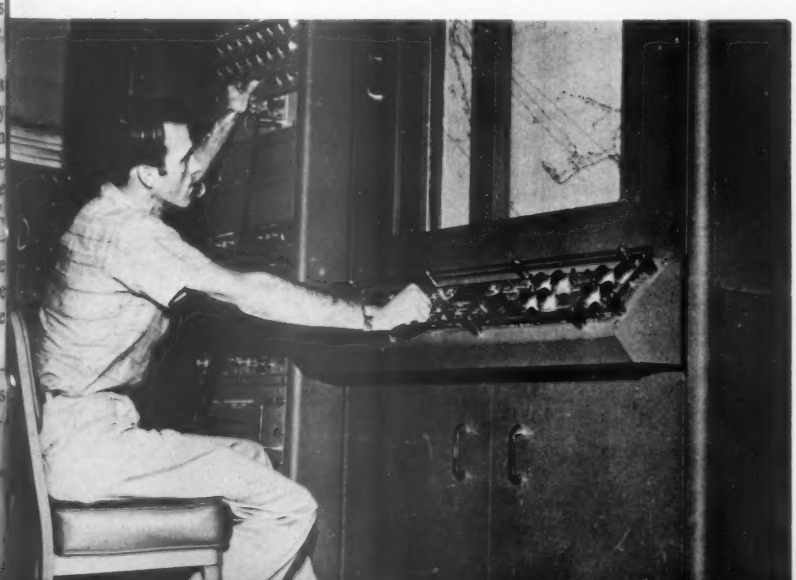
The gantries, or service towers, used in preparing the missiles for launch dominate the skyline on the seaward side of the Cape. The new service tower at Space Launch Complex 36, from which the flight of the *Atlas-Centaur* will originate, is now nearing completion. Standing as tall as a 17-story building, the steel tower rolls along double rails to straddle the launch pad. Central work platforms are enclosed on three sides, and elevator shafts are fitted in the wings. *Centaur,* a multipurpose vehicle, is expected to launch heavy satellites into 300-mile orbit later this year.

The type of gantry and other equipment associated with each launch pad depends, naturally, on the missile for which it is tailored. The space towers used with the *Atlas* are over a hundred feet tall; the missile itself measures about 85 feet. On the newer *Titan* complexes service towers work on the erector principle. Instead of rolling back from the pad on rails, the gantries are raised into position for pre-launch servicing and lowered before firing.

Each launch complex includes its own blockhouse from which the buttons are pushed to place the missile in flight. Blockhouses, such as those on the *Atlas* sites, are built of reinforced concrete with walls averaging 12 feet in thickness. The structure is designed to withstand a blast of 50,000 pounds of TNT at 50 feet. For complete safety, however, the blockhouse is situated 750 feet behind the launch pad. By way of comparison, the blockhouse for the *Polaris* is only about 150 feet from the launcher. The structural design of blockhouses and other protective and safety devices at AFMTC is considerably more elaborate than would be required with an operational weapon system in the hands of the combat commands.

When missiles are delivered to AFMTC for flight-testing, they are first sent to the Industrial Area, to the hangar occupied by the agency or contractor concerned. Here final assembly and component checks are conducted before the missile is moved to the launch pad and raised into position in the gantry. The final checkout at the launch site may consume from two to three weeks, depending on the type of vehicle, its status in the development cycle, and the nature of the test involved.

During the pre-launch check and the actual flight test, the blockhouse is occupied by the launch crew. When the missile is pronounced ready for firing, overall direction of the test passes to the Operations Room in Central Control. This is the focal point and nerve center for all flights over the Atlantic Missile Range. Here the instrumentation and other essential preparations are coordinated. Information on range clearance, readiness, and safety is assembled and examined before final



Lines marking flight of a missile and the point of impact at any moment if flight were terminated appear on plotting board to the right of the panel.

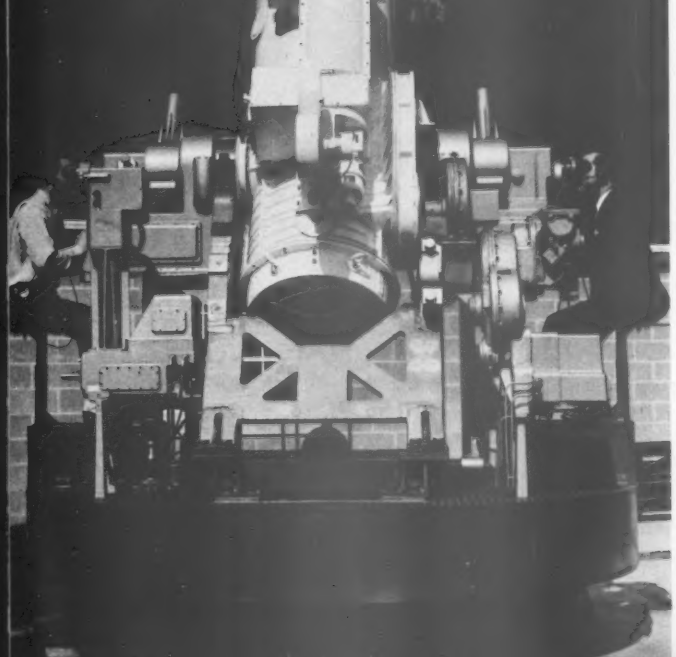
approval for the launch is given to the blockhouse.

The Range Safety Officer has his station at Central Control, and this position is always filled by an Air Force officer regardless of which agency is conducting the test. Well in advance of the scheduled lift-off time, radar sweeps the three ocean warning areas to detect the presence of shipping or aircraft that might be endangered. The findings are relayed to Central Control where the position of ships and their courses are plotted. In addition, radio frequencies are monitored to insure that there is no interference on channels used for communications either to or from the missile. C-131 aircraft, equipped with special detection gear, may be sent up to seek out the source of any interference encountered.

When approval for the launch is passed to the blockhouse, the final countdown takes place and the button is pushed to start the automatic sequencer which will ignite the rocket some 20 seconds later. As soon as the vehicle leaves the pad, Central Control again takes over to monitor safety and supervise flight-data collection.

Every missile fired has a predetermined flight corridor in which it must remain during flight. If it veers off course to either limit of this corridor, the Range Safety Officer triggers a device which causes the missile to destroy itself. With aerodynamic missiles such as the *Mace*, a wing may be blown off. In ballistic missile flights, the flow of fuel may be shut off, or—in some cases—an explosive charge can be detonated to rupture fuel tanks or other components. There are a variety of methods for accomplishing "destruct," and in any event it must occur so that all debris will fall within the established impact zone.

Technicians sit at sighting telescopes, components of ROTI, the long-range camera used to record on film the early flight stages of missiles launched from the Cape.



Among the facilities available to the Range Safety Officer is an electronic tracking system called AZUSA which collects continuous precision data on the position and velocity of the missile. The AZUSA Mark II system uses 10 ground antennas housed in pressurized radomes, and a device inside the missile which transmits signal impulses to the ground. The data gathered are fed into a high-speed digital computer and recorded on a plotting board in Central Control. These computations, more than 10 every second, keep the Range Safety Officer constantly apprised of the predicted impact area—the spot, that is, where the missile would fall in the event of power failure at any given instant.

During the four or five minutes of powered flight by an ICBM the missile may attain a speed of over 20,000 feet per second and an altitude of nearly a million feet. In this time the position of the vehicle is measured twice every second to an accuracy of within 10 feet. The Range Safety Officer shoulders a heavy responsibility. The weight of decision rests with him. A touch of his finger can terminate any flight.

But launching the missile is only one part of the task. The primary purpose of flight tests at AFMTC is to record the performance of vehicles under the most exacting laboratory conditions. The instrumentation used to gather flight test data over the Atlantic Missile Range is the most sophisticated of its kind in the world. From a cost standpoint, instrumentation represents a major portion of the Center's billion-dollar capital plant investment.

Some of the information is recorded on motion-picture film, with cameras positioned—in some cases—as close as 12 feet from the roaring fiery blast at the launch pad. Other cameras, manned and unmanned, record the position of missiles during initial phases of the trajectory, and the use of theodolites extends the camera coverage still farther.

Real star of the motion-picture system, however, is the ROTI, or Recording Optical Tracking Instrument. This camera is so sensitive it could pick up a baseball eight miles away and still get an image on the negative. ROTI is used to photograph the actual performance

of the missile rather than its position. It can follow the missile in flight at ranges up to 200 miles to record flame pattern, flight attitude, stability, and so forth.

In addition to the motion-picture coverage and the AZUSA radar system, the principal source of flight-test data is telemetry. Up to 75 percent of the data gathered in a flight test is obtained by this means.

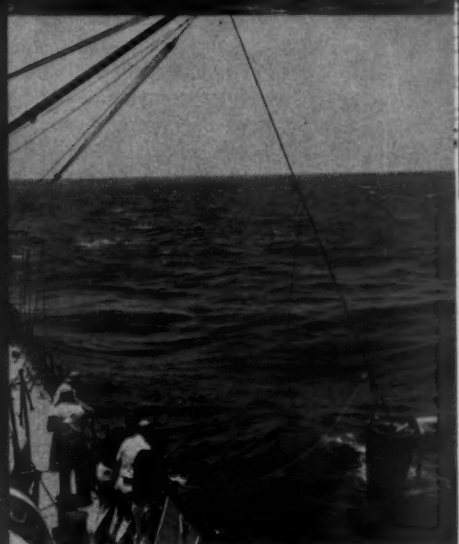
The principle of telemetry is relatively simple. It consists of small radio transmitters placed inside the missile which send information on as many as 175 separate functions on each flight. This information is picked up by receiver stations and recorded on magnetic tape. Following completion of the flight test, all of the data—magnetic tapes, radar plots, photographic film, and other information—are rushed to the AFMTC data reduction facility at the Technical Laboratory on Patrick AFB.

Here the raw data are fed through automatic reduction processes. In a matter of days, the end product of thousands of man-hours expended on a specific flight is available. Thus, long after the actual flight, the missile can be "flown" again and again in the laboratory. Each flight-test report advances the nation one more step forward on the missile/space development program.

The chain of tracking stations serving the Atlantic Missile Range begins with Station 1 at the Cape and Station 2 at Jupiter Inlet about 100 miles to the south. Several other small tracking stations on the Florida coast are manned only during flight tests. First of the off-shore installations is Station 3 at Grand Bahama Island, a part of the British Crown Colony of the Bahamas. Stations 4 through 9 are at Eleuthera Island, San Salvador, Mayaguana, Grand Turk, the Dominican Republic, and Puerto Rico respectively.

Station 9.1, newest link in the chain, is at Antigua, largest of the Leeward Islands located 1,250 miles from Canaveral, and was established primarily for the ballistic missile programs. Station 10 at Santa Lucia, on the other hand, was designed originally to serve cruise-type missile tests and is now on stand-by basis.

The island of Fernando de Noronha is the site of Station 11. This dot of land, only six miles long and a mile and a half wide, lies 230 miles off the coast of Brazil in the South Atlantic, 3,900 miles from Florida.



Eleuthera AAF. The downrange tracking stations follow the flight of the missile and transmit data to laboratory at AFMTC.

Station 12 at Ascension, a rocky, volcanic outcropping in mid-ocean more than 5,000 statute miles from Station 1, completes the chain.

The AFMTC downrange stations are manned in some cases by no more than a handful of people. Others range up to communities of 200 technical and maintenance personnel. While the workers are employees of the contractor company, each station is commanded by an Air Force officer. The size and type of stations is determined by the tracking requirement at the particular location, but all stations have certain similar instrumentation. This includes tracking radars used to follow missiles in flight and record their position, and a telemetry receiver to record the signals transmitted by the missile. Each station also has a timing signal generator which ties together to a split second all the instrumentation at all stations being used for a particular test.

While the island stations in the Caribbean area are located conveniently near to each other, distance originally posed a problem in the South Atlantic. From Antigua to Fernando de Noronha there are more than 2,500 miles of empty ocean, and from there to Ascension another 1,400 miles of salt water. To bridge these gaps AFMTC employs a fleet of six oceangoing range vessels. The ships of this "white fleet" are former government cargo carriers, now modified and equipped with electronic equipment similar to that used on the island stations. When a flight test is scheduled, the floating range stations move out to take up specified positions and can remain in place for 15 days if necessary.

A further vital component of the overall tracking system is provided by the 6560th Operations Group of Patrick AFB. Using JC-54 and JC-130 aircraft equipped with telemetry receivers, the crews of the 6560th fly missions over the test areas, gathering data to supplement that of the other stations and locating the impact point of nose cones or capsules as required. The ocean range vessels and the flying laboratories of the 6560th made it possible to extend the Atlantic Missile Range beyond the tip of Africa for the 9,000-mile flights of the *Atlas*.

What of the future? Progress in missile/space exploration over the past four years has erased the horizons of earlier perspective. The limits of potential achievement are far ahead in the future out of sight. Before too long the first flight of the *Saturn* will take place at Cape Canaveral from the special complex now under construction. This is the 1.5-million-pound space booster intended eventually to place multi-ton segments of a space station into orbit, and in later forms will place a manned space ship in orbit around the moon.

Science, industry, and the military services are joined together in pursuit of great aspirations. They hold one end of the rope in their hands. The other is extended somewhere in the future, beyond the limits of present-day vision.

Each year of success at AFMTC lights another milestone of progress for USAF in pursuit of national goals.

Supersonic Bridge to Aerospace

With the new *Talon* comes a new era in pilot training

by **DURWARD G. WESTERVELT, Hq Air Training Command**

IT WAS MARCH 17, 1961, St. Patrick's Day, and wearing of the green was the vogue at Randolph AFB, Tex. But the people assembled at the flight line were there for another reason. The Air Force was about to launch a new era in student pilot training.

The date featured an event for Air Training Command comparable to the ribbon-cutting ceremony of a new bridge. ATC's "new bridge" was to extend skyward into the aerospace age.

At this event, the new bridge was the acceptance of Air Force's first supersonic trainer, the Northrop T-38 *Talon,* which bridges the speed gap between trainers and combat types.

The first T-38, piloted by Lt. Col. Arthur Buck, ATC's T-38 project officer, was delivered officially to Lt. Gen. James E. Briggs, ATC commander at Randolph. The public was invited to attend the brief ceremony. St. Patrick's Day was coincidental. This was a day to be recorded in USAF history. Air Force dignitaries from over the nation and local civic leaders were present as witnesses.

The delivery of the first *Talon* scored not only as the arrival of the first supersonic trainer, but its acceptance coincided with the adoption of the first all-jet program for training Air Force pilots. On March 17, the *Talon* became a vital unit in ATC's first all-jet training team, joining up with the Cessna T-37 and the Lockheed T-33.

For a time, these three jets will be the trainers in which USAF students will learn to fly, progressing from the 400-m.p.h. class T-37 to either the 500-m.p.h. T-33 or to the supersonic T-38 to win their wings at Mach 1.2.

Then, with Mach 1.2 experience bridging the speed gap, some new pilots will enter advanced flying training in Mach-2-plus combat types of this decade better equipped than ever before to accomplish their assigned missions in Aerospace Power for Peace.

Medical personnel express vital interest in human factors associated with sophisticated new aircraft. Maj. Gen. Oliver K. Niess, Surgeon General, USAF, inspects new supersonic T-38.

The *Talon* was born for the specific job. This trim, twin-jet trainer with speeds in excess of 800 m.p.h. flies faster than any American plane ever flown in actual combat. Its landing speed is faster than the cruising speeds of the advanced trainers of World War II.

In less than 20 years, the speeds of aircraft trainers have jumped from 100-150 m.p.h. to the supersonic speeds of the *Talon,* an increase of five to eight times the World War II trainer speeds. During the same period, speeds of operational aircraft rose from the 200-400 m.p.h. range to twice or three times that range. The marked increase in training-plane speeds indicates how progress in flight instruction has more than kept pace with advances in operational aircraft.

Maj. Gen. Benjamin D. Foulois (right) discusses merits of 1914 pusher plane with Billy Parker. Craft flew in airshow welcoming the T-38 to ATC.

Meanwhile, during this same period, student pilots have not changed much, except all USAF students in future classes will be college graduates. They still like their steaks, and they still possess the best capabilities in the world. It's the training techniques and equipment that have had to change to successfully prepare the man to meet the challenge of the sophisticated machines at the threshold of space.

The T-38 was designed to bridge a speed gap. Back in 1953, on the basis of new high-performance fighters and interceptors on the drawing boards for operational use in the '60s, ATC issued a requirement for a training plane to replace eventually its subsonic T-33. By mid-1956, the Northrop Corporation was awarded a development contract. This was the birth of the T-38 *Talon.*

Design of the *Talon* was completed early in 1958, and by autumn of that year the first airframe had been built. On April 10, 1959, powered by two non-afterburning General Electric YJ-85-2 turbojets at 2,100 pounds thrust each, the YT-38 made its maiden flight at Edwards AFB, Calif. The first flight with the GE YJ-85-5 afterburning engines was in January 1960.

The cornerstone of the T-38 development was its twin-jet power plants. The two J-85-5 engines, each weighing 525 pounds, produce 7.3 pounds of thrust for every pound of engine weight. They can lift the fully loaded, 11,600-pound aircraft from the runway after a 2,600-foot run. The sea-level climb rate is near 30,000 feet per minute, the ceiling above 55,000 feet. The plane can maintain supersonic speed in level flight from sea level to 50,000 feet.

These qualities mean that ATC can now instruct student pilots in such techniques as high sink rates (rates of descent in landing attitude), high-altitude supersonic flight, high-altitude formation and naviga-

Instructor-pilot in rear seat of T-38 is in a position 10 inches higher than his student, thereby allowing good visibility for both.

tional problems—techniques that are peculiar to Century Series fighters and interceptors.

There were other considerations in the selection of the T-38 as a trainer. A major problem facing ATC was the gradual loss of logical training sequence. For example, in the 1953-1955 period, ATC foresaw the performance gap between trainers and upcoming tactical aircraft. Propeller-driven trainers definitely would not bridge the gap.

Destiny was riding the airlanes. An all-jet training team was the future answer, with a supersonic trainer for the transition to the tactical planes. With the arrival of the T-38, this all-jet combination became a reality.

This brought an end to an era in pilot training for the Air Force.

Gone are the propeller-driven trainers for Air Force student pilots. Conventional types, such as the Beech T-34 and the North American T-28, now have flown across the pages of time to join soon the ranks of the T-6 and other oldtimers. (The T-28 is still the MAP trainer and will be in the future for indefinite time.)

Length of the new *Talon* is 44 feet. Its wing span is 25 feet 3 inches, and its height 11 feet 11 inches.

Rated with the flying capabilities of supersonic combat types, the T-38 incorporates within its design, safety and maintenance features that were the result of comprehensive study by USAF and Northrop. Included among its safety features is the point that the *Talon* is capable of single-engine takeoff and landing at maximum weight.

In the T-38, visibility is excellent for both the student and the instructor who is seated behind the student in a position 10 inches higher than the student's forward seat.

Approximately 28 of the sleek trainers will be used at Randolph for Category III testing in which ATC will subject the aircraft, support equipment, and personnel to various tests and evaluations under operational conditions. The initial flights of last year at Edwards were to prove and evaluate subsystems. Systems were tested and evaluated in the second phase of the flight-test program, completed a month ahead of schedule in February 1961.

Following completion of the first portion of Category III tests in September 1961, the first student class will begin training in the *Talons,* and a firm training syllabus will be verified. Completion of Category III is programmed for March 1962 when the new plane will become operational throughout ATC's pilot-training program.

Looking farther to the future when the T-33 retires, the flight training sequence will be in the T-37 for primary, the T-38 for basic, followed by advanced training in two-place versions of combat aircraft and in other types.

The *Talon* also is scheduled to perform its mission at less cost than other jet basic and advanced combinations.

Thus, this fast-stepping trainer—the first of its kind in the Free World—joins the Air Force team to help ATC "Prepare the Man" to meet the supersonic Aerospace Age.

The J-85-5 engine used in the T-38 qualifies as the powerplant with the highest thrust-to-weight ratio of any turbojet engine now in production.

DISCOVERER—TRAILBLAZER TO SPACE

by MSGT. FRANK J. CLIFFORD, Airman Staff

FOR ALL WHO WERE ON THE SCENE, and for many, many more who were present in spirit only, January 21, 1959, at Vandenberg AFB, Calif., was a black day for the Air Force. That was the day *Thor* 160 was to boost an instrument-packed *Agena* satellite vehicle into polar orbit to begin the *Discoverer* series of experiments. Object: to develop basic techniques from which a diversified arsenal of satellite systems was to grow.

Thor 160 never got off the ground—that day.

But the research program did. A month and a half later, on February 28, *Discoverer I*, a *Thor-Agena* combination shouldering a 1,300-pound payload streaked upward from launch complex 75 at Vandenberg's Purisima Point overlooking the Pacific. Obediently on cue, *Discoverer I* heeded instructions from its "holes-in-the-head" brain, the perforated tape program which directed its guidance system, and entered a near-polar orbit.

All doubt that a polar orbit could be achieved vanished with this shot, belying a 1955 Russian pronouncement that such a path was all but impossible. Difficult, yes, but *Discoverer I* demonstrated that precision equipment in the hands of skilled technicians makes all the difference in the world—or out of it.

Discoverer I lived for less than two weeks, playing hide and seek with ground tracking stations whenever its stabilization gear became cranky. When in the mood, which was more often than not, her 30-pound instrument package transmitted data to her ground-hugging masters as she circled the earth every 95 minutes.

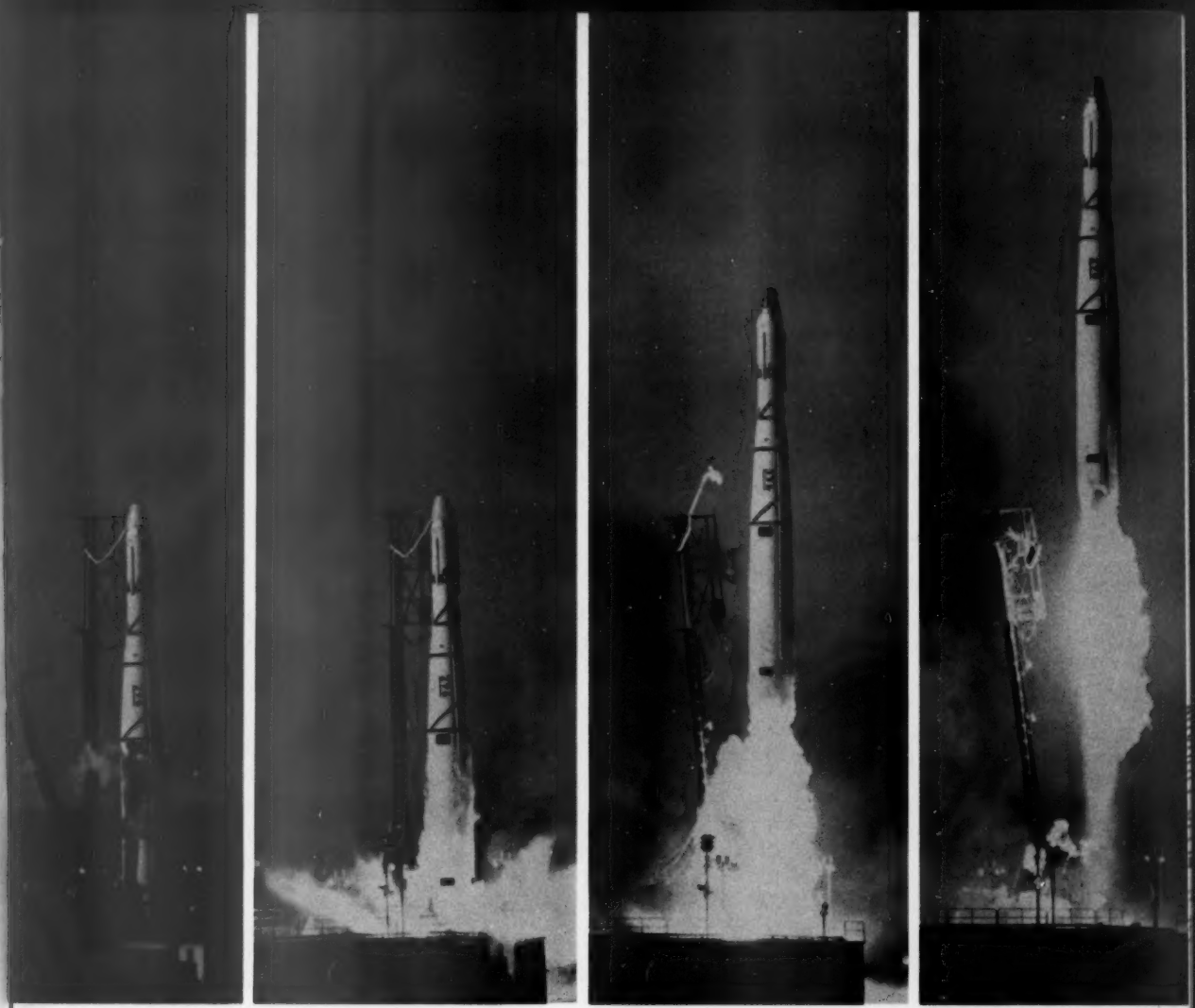
Discoverer I was the first in an "open-end" program to develop a dependable satellite system with the following capabilities:

Launch of earth satellites having on-orbit weights of 1,300 to 1,800 pounds.

Achievement of a high degree of reliability in putting satellites into exactly the desired orbit—low-altitude near-circular polar loops.

Stabilization of the satellites on orbit, re-positioning the vehicles at will, and re-stabilization in any desired attitude with respect to the earth.

A tracking and communications network able to determine precisely the orbital characteristics of satellites, acquiring data from the vehicles and issuing such



commands as are necessary to control future actions.

Separation of parts of the vehicles, the recovery capsules, which could successfully re-enter the atmosphere to be recovered from the sea or snatched in mid-air.

A most ambitious program! As of now, two and one half years later, how well has the Air Force succeeded in reaching the target goals? What is the outlook?

A one-sentence reply answers both questions: the Air Force has exceeded the original aims of the program and has at the same time opened the door to new frontiers in aerospace science. Since *Discoverer I* thundered upward toward its place in history, 20 others have followed it. More will come.

Seeds of an Idea

The *Discoverer* story had its beginning some 13 years before *Discoverer I* was lit-off in 1959, and long before its first-stage booster, the *Thor* IRBM, was an engineer's doodle on a drafting table. It began even some years before Russia's *Sputnik I* announced its orbiting presence with its eerie "beep-beep-beep" signal.

Following recommendations sketched out in a series of studies conducted under Air Force contract by the Rand Corp. in 1946-47, Gen. Hoyt Vandenberg, then Chief of Staff, urged in a 1948 policy letter that: ". . . research and development of a satellite should be pursued as rapidly as the state of the art permits."

Then, as now, the principal aim of the *Discoverer* program was to develop techniques and hardware to place at will and into precise orbit satellites capable of performing a variety of *military* missions. The military value was the first consideration; if other results of general scientific interest emerged, fine.

Early in the program the Air Force recognized that a polar orbiting satellite would produce the most effective military results since the earth, in its east-to-west rotation, would be turning beneath it, displaying itself completely with precise regularity every 24 hours.

An east-to-west, or west-to-east orbit would produce only a very limited military advantage because the satellite would over-fly only a narrow strip of the earth's surface, "seeing" the same ground over and over again. An equatorial orbit, for example, would place the satellite in flight over land that is largely uninhabited;

undeveloped masses of jungle and desert.

It had to be a polar orbit!

But this trick is more easily prescribed than performed. A satellite launch to the east is easiest of all since the launch vehicle gains additional thrust from the earth's rotation; a westward launch results in a loss of escape thrust since the rocket is, in effect, "taking off against the wind."

So it had to be a polar orbit for *Discoverer!*

Faltering Steps

This decided, the next order of business was the creation of the hardware to do what slide rules said *could* be done, and what military necessity said *must* be done to preserve national security.

Men make machines and men direct them to their tasks. Finding the men and welding them into a team fell to Maj. Gen. Bernard A. Schriever, then Air Force Ballistic Missile Division commander, now a lieutenant general and commander of Air Force Systems Command. That he succeeded is a matter of record, scrawled across the heavens by a long series of highly successful missile launches in a variety of programs.

To a trained athlete the stumbling performance of a novice is sometimes amusing; to an uninformed public the groping progress, the abortive starts, and the heartbreaking humiliating failures in the early days of the U. S. aerospace effort were not amusing. Strident voices, often without reason, were quick to utter criticism.

To seasoned engineers the U. S. aerospace progress was no rockier or more hesitant than they expected. Problems that never existed before demanded immediate solution—solutions that more often than not created out of thin air other problems unimagined the day before.

Meanwhile the clock ticked on, the days turned to weeks, to months, to years. Time and operational capabilities—the hardware and the technique—were the unrelenting lash.

Before *Discoverer I* blazed its way to glory a primary, or first-stage, launch vehicle had to be found, and to go with it, a satellite vehicle controllable either from the ground or by pre-set instructions "memorized" on perforated tape.

An Era Gains Momentum

It should be recalled, of course, that *Discoverer I* was by no means the first satellite launched by the U. S. and that missile and space programs were moving forward on several fronts. *Explorer I,* put into orbit February 1, 1958, is still swinging about the earth. A small satellite, weighing only 30 pounds on orbit, this vehicle discovered and reported the Van Allen radiation belt. *Vanguard I,* launched March 17, 1958, to determine the earth's shape more accurately, is not only still in orbit but its solar-powered transmitters still function. Another Methuselah of the missile age is *Vanguard II,* launched February 17, 1959 and still in orbit.

Heavyweight champ, now deceased, was the modified *Atlas* ICBM used in *Project Score.* Launched December 18, 1958, the *Atlas,* minus the half-stage, went into orbit weighing 8,750 pounds, a figure which included a 150-pound communication package. In this experiment a human voice was beamed from outer space for the first time. It was also the first satellite known to have been guided into orbit by a radio-inertial system.

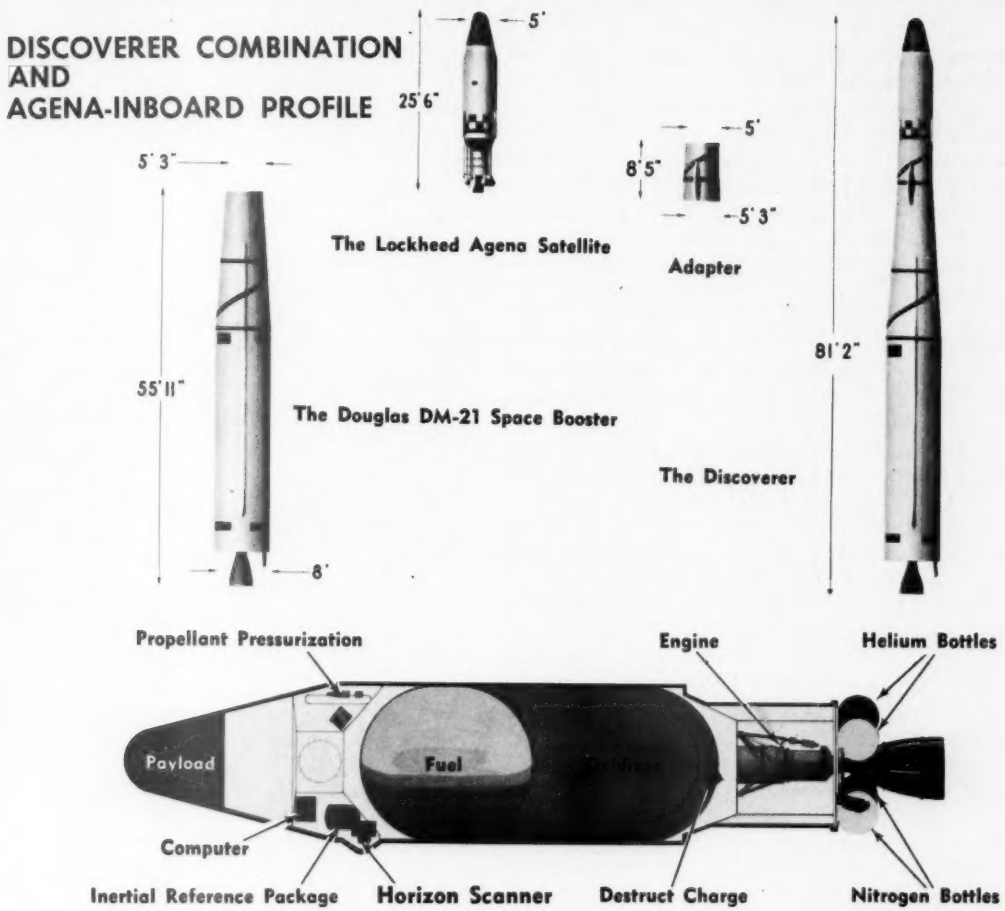
A tense moment! Capt. Donald Jansen checks and rechecks subsystems and components of *Thor-Agena* combination employed in the *Discoverer* program.

Thus hardware and the know-how were gradually accumulating. The search for *Discoverer's* launch vehicle centered on two proven boosters. On hand was *Atlas,* the U. S.'s first intercontinental ballistic missile, a stainless steel giant with a take-off weight of 260,000 pounds propelled by a 360,000-pound-thrust, liquid-engine powerplant.

Simultaneously, *Thor,* almost dainty by comparison with *Atlas,* was striding from drafting table to development shop, to prototype, to captive test, to successful launch. *Thor,* standing 62 feet tall, was 13 feet shorter than *Atlas;* her waist, eight feet in diameter, was two feet narrower; her rated thrust a modest 150,000 pounds, but more than enough to lift her 90,000-pound take-off weight.

Atlas or *Thor,* which would get the nod as the first-stage rocket to put *Discoverer* into orbit?

Thor was picked for the very practical reasons that she was further along in development, having by this time several dozen highly successful shots on her record,



was relatively inexpensive and available in quantity, dependable, and her launch facilities could easily be modified to suit *Discoverer* requirements.

Neither *Atlas* nor *Thor* of themselves had the power to loft a satellite into the precise orbit desired. What was needed was a second-stage vehicle, but not one that was just another simple powerplant. A sophisticated vehicle was required, capable of injecting itself into orbit at just the right instant, turning itself 180 degrees on its yaw axis, and correcting its relationship to the earth. In addition, the vehicle would have to be able to start its own engine, calculate the number of times it orbited the earth, make minor changes in attitude as ordered by self-contained instruments, and fire the retro-rocket that would separate the data package.

Such a vehicle is *Agena.* The name is a happy choice for Agena is also the name of one of the 10 most brilliant stars in the heavens. The celestial Agena is just east of the Southern Cross which marks the location of the celestial south pole, the area at which launch crews must aim to put satellites into polar orbits.

A Discoverer *Comes Home*

One of the more spectacular aspects of the *Discoverer* series is the recovery of a data capsule after the satellite has circumnavigated the earth a given number of times.

Snatching the device in mid-air as its parachute eased it to the sea was the obvious answer. How this air snatch would actually be carried out was not so obvious, but the Air Force got moving on the project almost three years ago with the formation of the 6593rd Test Squadron (Special) of the 6594th Recovery Control Group.

Flying C-119 *Flying Boxcars,* the airborne outfielders crisscrossed the sky trailing their trolling gear in practice snatches for "tame" capsules dropped from high-flying planes. The ponderous twin-boomed cargo planes, never considered aeronautical beauties by even the most partisan admirers, looked even less handsome with the addition of the recovery apparatus.

Two 38-foot poles arranged in a sort of "V" with the apex point forward extend from the gaping mouth of the loading hatch in the rear. A double loop of nylon cable with special grappling hooks stretches across the 15-foot gap between poles to form a trapeze. The nylon cable passes along one of the poles to the plane where an ingenious pay-out and "damping" system smothers the initial shock of snaring the dead-weight of the 300-pound data package.

A power winch is used to bring the capsule aboard the aircraft.

In practice sessions aircrews tallied a 95 percent score in air-snatch techniques. But this was with "tame"

capsules dropped from planes which were not literally flying out of this world. How would the technique work in snaring a capsule hurled from a carrier rocketing along at 18,000 miles per hour? Try it and find out, was the only answer.

Irony was to take a hand in the first recovery of a *Discoverer* capsule. On August 11, 1960, Capt. Harold E. Mitchell, flying with a crew of eight out of Hickam AFB, Hawaii, picked up a signal from *Discoverer XIII*. It was headed for his patrol area. Poor reception made setting an intercept course impossible; an assist was asked from a nearby radar control plane. Unfortunately, something went wrong and by the time Mitchell reflew his route the capsule was observed bobbing in the sea. A Navy crew recovered it.

Galling as this was to Mitchell and his crew, his sense of frustration was mild compared to that of another Air Force officer, the man who had sweated out 12 previous launches at the Test Controller's console in the Air Force Satellite Test Center, 140 miles north of the launch site at Vandenberg. Col. Charles G. "Moose" Mathison saw eight of the first 12 *Discoverers* go into orbit. He was now hovering over the launch of the 13th, having obtained permission to preside over "just one more" before moving to higher headquarters and new responsibilities.

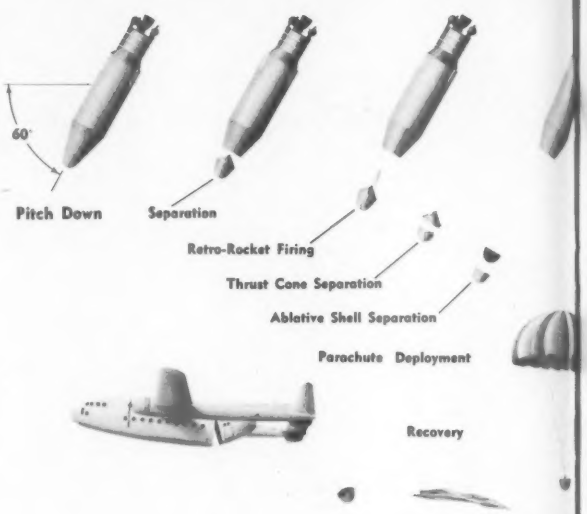
Six of the eight orbited satellites ejected capsules. One landed near Spitzbergen, Norway; two failed to emit radio signals announcing their whereabouts; two overshot the patrol area by several hundred miles. None had been recovered.

Immediately after presiding over the launch of *Discoverer XIII* at 1:30 p.m., p.d.t., August 10, "Moose" hustled to a waiting C-130 and winged off to Hickam, flying the four-engine turbo-prop transport himself part of the way. He was determined to see that this one did not get away.

When it was certain the capsule had survived the searing temperatures generated on re-entry, Colonel Mathison rustled up an SA-16 *Albatross* amphibian from the Air Rescue Service to have a look for himself after being told it was in the water. Advised that the Navy had recovered the capsule Mathison returned to Hickam but his eagerness to get his hands on the first *Discoverer* capsule to be recovered put him back in the air again, this time in a helicopter that deposited him aboard the recovery vessel. Claiming the capsule, he loaded it aboard the helicopter, along with the Navy men credited with the actual sea recovery, and returned to Hawaii.

Discoverer XIII is now on exhibit in the Smithsonian Institution, Washington, D. C. An interesting sidelight marked the try before "Lucky 13." *Thor* No. 160, the cranky booster that was to have launched the *Discoverer* series but fizzled on the pad, had been rebuilt and scheduled for another try. Her designation? *Discoverer XII*. Launched June 29, 10 days before *Discoverer XIII*, she got off the ground this time but burned up shortly thereafter on re-entering the atmosphere when she failed to achieve orbit. For having twice missed a

ORBIT EJECTION AND RECOVERY



niche in Air Force history *Thor* No. 160 slipped into the archives by a back door—often a bridesmaid but never a bride.

At Last

For a week Captain Mitchell contemplated the vagaries of fate. But for a navigational error not of his making he and his crew might very well have been the first to snatch a data capsule in mid-air. Was he to lose his chance forever? Were his two years of training to be added to his already well-stocked fund of experience?

Fate cast a wan smile toward Captain Mitchell when *Discoverer XIV* roared from its pad at Vandenberg at 3:15 p.m., e.d.t., August 18 and went into orbit as planned. This would give Mitchell and his crew another shot at "fielding" its capsule—but the "playing field" was to be an enormous rectangle, 600 miles north-south, 60 miles east-west. Thirty-six thousand square miles of water. He would not patrol it all, of course, and when he received his assigned sector, Mitchell realized that Fate was not through playing games with him. His 8,000-square-mile patch of sky and water was 400 miles from the expected impact area.

As if this were not enough his crew chief, TSgt. Lou Bannick, brought him the dolorous news that a cylinder on No. 1 engine would have to be replaced. With *Discoverer XIV* already in orbit could the engine be put back in running order in time for Mitchell to be on station? Mitchell slept uneasily that night as the ground crew struggled with the engine. The crew delivered the goods and when final briefing took place the next morning at 7:30 Captain Mitchell and his crew got their orders.

There would be 10 C-119 recovery craft in the grid,

Skilled AF paramedics, with full Scuba gear, . . .

plus one C-130, a much faster plane with a higher cruise altitude. In addition there would be four control planes fitted with powerful radar, seven planes with telemetry receiving gear, and two Navy ships with helicopters and frogmen aboard if a water recovery was indicated.

"Pelican" was the code name assigned to the 10 recovery planes, with Mitchell's plane being dubbed Pelican Nine. By the time Mitchell and the others took off at 9:10 for their station *Discoverer XIV's* 1,700-pound satellite was solidly in orbit with its 300-pound re-entry capsule. Once every 94.5 minutes it circled the earth at 17,658 m.p.h. swinging out in an apogee of 502 miles and in on a perigee of 116 miles.

Pelican Nine droned toward its patrol area at 250 m.p.h. *Discoverer XIV Agena* was performing perfectly, correcting a slight tumbling tendency. Capsule ejection was set for the 17th pass over Alaska.

The tenseness aloft was matched in the windowless Satellite Test Center at Sunnyvale, Calif., where men of Col. Alvan N. Moore's 6594th Test Wing (Satellite), along with high-ranking Air Force officers and scientists, were keeping a close vigil on *Discoverer XIV*. Information from tracking stations at Vandenberg, Point Mugu, on ocean vessels, in Alaska and New Hampshire, and the island of Oahu in Hawaii, cascaded into STC by instantaneous voice lines as well as teletype. Inclement weather over the recovery area might make a postponement necessary, for example. All was well. *Discoverer XIV* would eject its capsule on the 17th pass as planned.

Fate was fond of Mitchell again. The capsule ejected, but it was overshooting its intended impact area and heading for Pelican Nine, now cruising at about 16,000 feet. With Captain Mitchell were Capt. Raymond Apaka, copilot; 1st Lt. Robert Counts, navigator; TSgt. Lou Bannick, recovery team chief; SSgt. Arthur Hurst, flight engineer; SSgt. Algaene Harmon, A1C George Donahou, A2C Lester Beale Jr., and A2C Daniel Hill, all of the recovery crew. SSgt. Wendell King, photographer, rounded out the crew.

At precisely the right time aboard the Agena satellite vehicle, explosive bolts and springs separated the re-entry capsule from the vehicle. Its parachute opened a few moments later and with it the automatic radio beacon put the capsule "on the air." The load began to sink at about 1,600 feet per minute.

Minutes afterward the crew of Pelican Nine sighted the brilliant orange and white canopy of the capsule. More than two years of training would now meet the test.

Pelican Nine's recovery gear was ready, the crew at positions. More than 600 feet of heavy nylon line was reeled tightly about the recovery winch; the trapeze trailed its grappling hooks from a kind of cat's cradle. All that remained was to swoop down on the parachute that lay dead ahead. Easier said than done.

It took three passes, each one lower, as the ocean rushed up to meet the capsule before Mitchell felt the slight tug that signaled success. In the rear of the plane hundreds of feet of line played out from its nesting place before the winch took up the load. The hooks

. . . will jump after data capsules that may miss the "flying trapeze" to land in the ocean below.

were set, and good. The capsule, having shed its re-entry heat-shield and retro-rocket when the 'chute snapped open, was slowly "landed" aboard Pelican Nine, cruising thousands of feet above the Pacific.

Two more *Discoverers* were launched before Capt. Gene W. Jones, flying in Pelican Two, snatched *Discoverer XVII* on November 14 after its re-entry on its 31st pass in a two-day flight. Three weeks later, on December 7, Jones and the crew of Pelican Two played a repeat performance when they took *Discoverer XVIII* out of circulation after its 48th trip around the globe. The three catches put to rout the critics' cry that the air-snatch scheme was just a stunt.

Scientific Knowledge Accrues

While the *Discoverer* series remains true to its original concept to devise and explore techniques leading to a dependable satellite system, other scientific investigations and experiments have been integrated into the program.

Discoverer II, launched April 13, 1959, carried emulsion packages to measure radiation, and an environmental package equipped to measure and report on internal conditions for possible life-support. The data capsule was lost when it was ejected prematurely over Spitzenberg. *Discoverer II* was the first satellite to carry a recoverable instrument packet.

Discoverer III vanished without a trace soon after its launch June 3, 1959, carrying with it four black mice, plus radiation and environmental research devices.

Discoverer XVIII, the third capsule snatched in mid-air, contained a wide assortment of physical and biological test materials. Included were algae, bone marrow, membrane from the underside of eyelid, gamma globulin, spores, gold foil, analine powder, and other material for a variety of medical and technical experiments.

Of great concern to Air Force officer-scientists who look to inter-stellar travel as something inevitable is the effect of cosmic radiation on human beings, and by extension, on other living things. Cosmic rays are particles smaller than atoms traveling with speed approaching the velocity of light. Since these are actually solid particles of matter they can be compared with ultra-microscopically small bullets.

Can these infinitesimal particles cause structural damage to the body? Could they produce mutations? Does the body have a tolerance on exposure to these rays? Or, are they completely harmless?

Mice exposed to cosmic radiation during high balloon flights have experienced hair color changes. But, they suffered no other apparent physical damage. One Air Force authority suggested the rays are harmless, that no shielding is necessary. Let the rays pass through, he says. The experiments go on.

The strange-sounding assortment of specimens listed above are not an arbitrary selection of odds and ends which happened to be lying about, convenient to the scientists. Each was selected after considerable study.

Mid-air catch of data capsule is no grandstand stunt, but is actually the most efficient way for recovering the instrument-filled container.

The spores were included because of their light weight, rapid growth, ready availability, and because a great deal is already known about their behavior under a variety of conditions. Seeds are sometimes included for the same reason. Each substance had to pass a rigid set of standards before going into the biophysics packet.

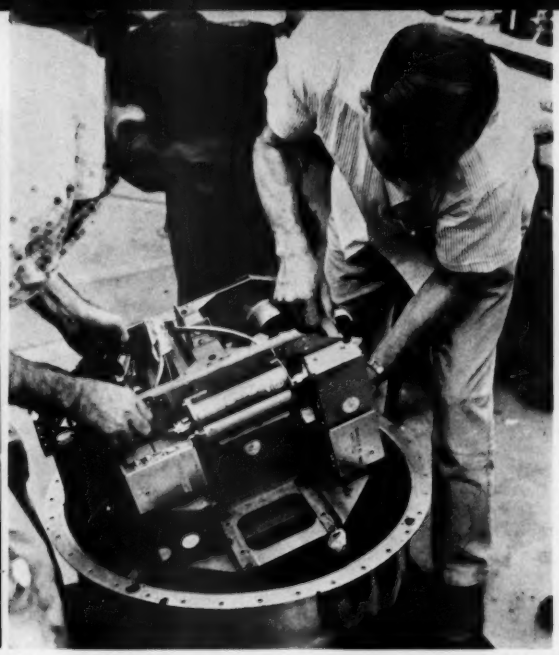
The *Discoverer* experiments, currently expected to last to the end of this year, have contributed immensely to technical aerospace lore. AFSC officer-engineers, working in close cooperation with their counterparts in industry, are already far along the road when they will have a dependable "screwdriver with a 300-mile handle" to make adjustments in satellites in orbit. Plans are afoot to enable ground-bound technicians to make a variety of repairs in orbiting bodies. The satellites themselves are being gimmicked to make simple repairs such as switching to alternate circuits when malfunction or expiration of the normal life of a unit requires the change.

With the precise polar orbit all but unfailingly within their grasp, AFSC scientists are talking of removing ineffectual satellites from orbit and replacing them, in exactly the same spot, with new ones.

Discoverer XXI, the latest in the series, demonstrated how close complete remote control of orbiting satellites is. Launched February 18, 1961, this satellite went in orbit as planned—and then changed orbit with a programmed restart of its *Agena-B* engine. While *Agena-Bs* have been in use since *Discoverer XVI* was launched October 26, 1960, this was the first attempt at a restart.

The frontiers of space are slowly giving way to the *Discoverer.*

Gotcha! Data capsule of *Discoverer XIV*, first to be recovered in mid-air, is hauled aboard C-119 after completing 17 orbital passes around the earth.



This gold-plated sphere contains a wealth of scientific information gathered as it whirled thousands of miles in orbit around the earth.

RIDING ATOP A *Thor* IRBM, the *Agena* goes into a coasting phase immediately after *Thor* burns out and explosive bolts separate it from the booster. During this period a pneumatic control system is activated. Compressed gas is metered through a series of external jets to position the vehicle. Initially, a programmer signals the pneumatic control system what to do. The vehicle begins to move in its pitch axis to a position which will be as close as possible to the local horizontal when it reaches orbital injection altitude. The infrared sensor carried aboard *Agena* "looks" for the horizon and sends corrections to the central system refining the programming actions.

During this crucial period ground tracking stations constantly monitor the vehicle on radar to measure velocity. Although ignition of *Agena's* 15,000-pound-thrust, liquid-rocket engine also is programmed, the ground station can compare actual velocity and position with the nominal and send radio commands to the programmer, advancing or retarding the moment of ignition. Once the ignition adjustment is made, an accelerometer in *Agena* measures the velocity gained and signals engine cutoff at precisely the right instant.

When the engine fires, the pneumatic control system is deactivated and a hydraulic system takes over. Guided by instructions from the infrared horizon sensor the hydraulic control linkage makes fine adjustments by gimballing the engine so that *Agena* is injected into orbit at just the right instant, the right place, the right altitude, the right velocity, and the right angle to provide the orbit desired.

In the two years the *Discoverer* program has been in existence the *Agena* vehicle has grown in size, weight, and complexity. The first *Agena-A* measured 19.5 feet in length, weighed 1,300 pounds on orbit, and carried no equipment for stabilization, reorientation, or capsule recovery.

Discoverer XVI saw the introduction of *Agena-B*, a sophisticated bird 26.5 feet tall with a weight of about 2,100 pounds on orbit. As the program moved ahead the thrust of *Thor* was increased from 152,000 to 167,000 pounds and that of *Agena* from 15,600 to 16,000. These power increases represent no great engineering changes in powerplants, but were achieved through weight reduction and the use of more efficient fuel. In the *Discoverer XX* flight, February 17, *Thor* was shortened about 10 feet by elimination of the unused guidance computer compartment with significant weight reduction. Additional thrust was gained by the use of a new fuel, RJ-1, which is slightly denser than the standard kerosene base rocket propellant.

SLANTS ON SPACE

To Catch A Falling Star

by WILLIAM A. KINNEY, Airman Staff

"And what is so rare as a day in June?"

So wrote James Russell Lowell more than a century ago in his paean to the ideal weather the month can bring. The words of this noted American poet almost seem to echo in the question now preoccupying many space scientists. They are wondering what *is* so rare about the days of June, although for a much less lyrical reason.

The reason: During June both professional and amateur observers have been spotting the fall of more meteorites than in any other month of a year. Records bearing out this fact go back approximately a century.

When June's sustained top average first attracted scientific attention the quest began to find an explanation for the phenomenon. It is still going on, thus far unrewarded by any definitive answer. Since the advent of the Space Age, however, the scientific investigation of meteorites has become urgent because of the information they can supply about the remote exterior realm which man is hoping eventually to explore in person.

Laboratory analyses of meteorites have yielded data such as how much cosmic radiation they received, how hot they became by friction in plunging through the atmosphere and how long the time has been since they were last molten. Of broader scientific interest is what cumulative light they may throw on the validity of various theories about the composition of the planets, the origin of the Solar System, and even the Earth's formation.

Popular curiosity about meteorites has been particularly piqued this year by a mid-March report to the New York Academy of Sciences. It asserted that for the first time a meteorite fragment had produced "preliminary" evidence pointing to the existence of organic life beyond the Earth.

The fragment came from a shower which fell near Orgueil, France, in 1864. It was subjected to the very latest in complex analytical laboratory techniques by the three scientists who collaborated on the report.

They succeeded, the paper states, in identifying the presence of chemical compounds in the hydrocarbon group closely akin to those found on our planet only in living plants and animals, the latter category including man, of course. The scientists acknowledged that interpretations of certain laboratory results were a factor in the conclusion reached, but added firmly:

"We believe that wherever this meteorite originated something lived."

Although intriguing to laymen this report to the New York Academy has been met with considerable reserve in scientific circles. Some experts have voiced frank skepticism about the validity of the "interpretations," claiming much more evidence is essential to determine whether the chemi-

cal compounds identified in the fragment could not be formed by some inorganic process. Radioactive dating of meteorites indicate an age range from 800 million to 4 billion or more years.

Public interest in the subject of meteorites as bearers of minute life forms got a further fillip in April with the disclosure that, at the National Institutes of Health, scientists for several months have been successfully growing in a culture some microscopic organisms obtained from a meteorite which fell at Murray, Ky., in 1950.

These particles are described as unlike any terrestrial organism known to their discoverers. They were found in the material from the core of the meteorite which was extremely dense in composition, an obstacle to the contamination of its interior by infiltrating organic matter of earthly origin. The relatively recent date of the meteorite's fall makes it "fresh" in comparison with the 1864 French meteorite which yielded the material for the New York research studies. And the "fresher" the meteoritic material, the less exposure it has had to contamination by earthly organisms.

The fact that the micro-organisms from the Kentucky meteorite have been propagating serially in different nutrient cultures is considered strong evidence that they are "living." However, scientists engaged in this study at the National Institutes of Health are slow to make any claims. They say they are not sure whether they are dealing with a bacteria form or something else. Nor do they express any certainty the tiny "bugs," as some call them, originated somewhere in Space. The possibility of contamination by some still unidentified earthly organism is being kept very much in consideration. The availability of even "fresher" meteoritic material of this particular variety could be an important boon for their studies.

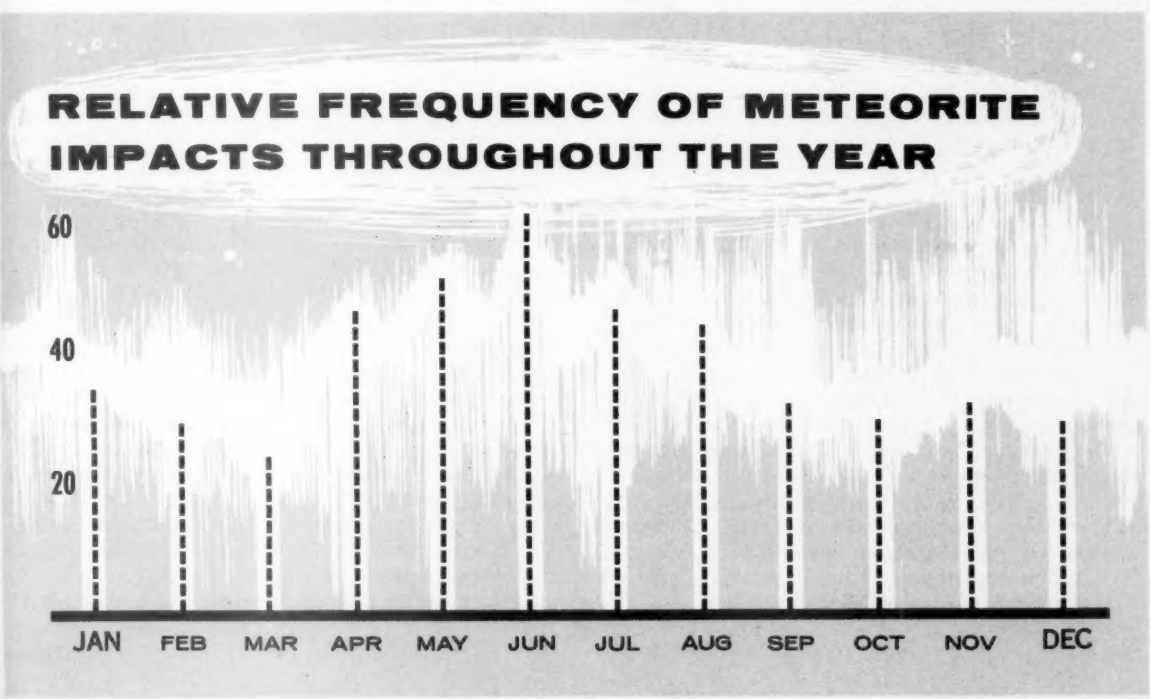
One handicap to getting programs of meteoritic research moving in high gear is the acute shortage of recovered meteoritic material. The ratio between meteorite falls observed and meteorites recovered is distressingly huge for experts.

However, once again it is June, and hopes for a better recovery rate are encouraged by the greater general interest in the heavens which the Space Age has brought. The growing army of enthusiastic amateur astronomers, the improved photographic equipment, the widening net of electronic and other systems for satellite tracking or detection are all factors on which such hopes are based. And of course, the more numerous the meteorite fall, the better the chances that some will be recovered.

In everyday language we may often use the words, meteor and meteorite, as if they were interchangeable. An expert will tell you, however, the two are *not* synonyms in his business. A *meteorite* is an object from Space that has impacted the Earth or some other solid body; for example, an artificial satellite or probe research vehicle. While en route to such a hit, the object qualifies as merely a *meteor*.

Various surveys and projections up through the past decade show quite a wide spread in estimates on the average number of meteors which penetrated our atmosphere daily. The figures range from one billion or so to as high as eight billions. There is agreement, however, that all but a minute percentage are consumed at very high altitudes. An estimated 24 million meteors daily are visible to the naked eye as glowing streaks in the course of their fiery progress earthward.

Lest that 24-million figure encourage eager beavers in the Air Force to think the odds are not too long against their chances of spotting meteors with the unaided eye, remember that visual sightings require



favorable weather conditions. Another thing to keep in mind: Meteors are peppering the atmosphere in far greater numbers during the daylight hours than after dark. Lastly, the 24-million estimate is for the entire globe, more than two thirds of which is covered by the oceans and seas.

As a rule, daytime observation of meteoritic impacts by amateurs has been limited to materials falling within their range of vision and attracting attention by the shower of soil the object may throw up, damage to a building, or some other physical evidence of disturbance.

By night the Moon can be the amateur observer's foe, so the darker the night the better the chances of a sky watcher sighting a meteor. This June will have relatively favorable nocturnal conditions. As the month begins, the Moon is in its last quarter phase and not until June 30 will we have a full Moon whose brilliance can obscure other celestial objects.

Meteorites are classified in three groups, according to their composition: the irons, the stones, and the stony-irons. There are a number of sub-classifications with technical names, but these are not relevant here.

Considerable progress has been made over the past several decades in determining the chemical composition of meteoritic material, and thus far no chemical element has been identified in meteorities which does not exist in the natural physical order on Earth. A compilation of verified data up to 1926 listed the presence of 26 elements. Today the figure stands at 83. Among the additions to the list since the '20s is gold, but meteorites containing it would hardly lure mercenary fortune hunters; the precious metal content in recovered material has run about an ounce or less per ton.

According to a series of scientific studies on observed falls, the great bulk of potential meteorites approaching the Earth are of the stone variety, representing 93.5 percent of the total; irons 5 percent; and stony-irons, 1.5 percent.

The record for material actually recovered, however, shows a drastically altered breakdown. Irons were easily the most numerous finds during the period studied, accounting for 66 percent of the total; stones were second with 26 percent; then stony-irons for the remaining 7.5 percent.

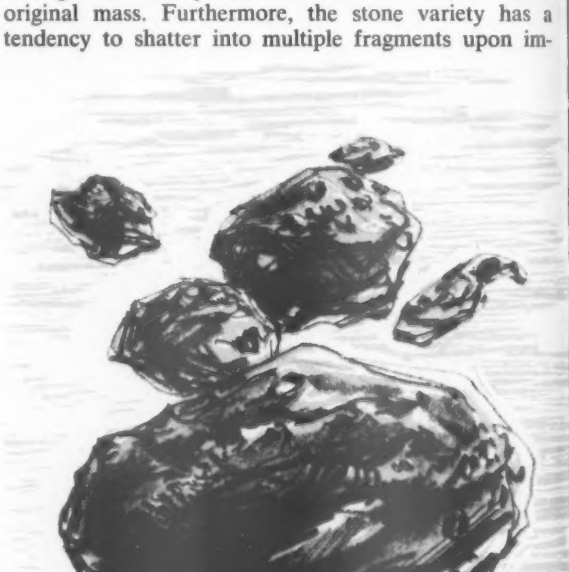
The names of the three varieties are not to be taken as literally descriptive. With rare exception, the chemical elements which make up the different type meteorites are found in compounds or alloys and not in the free state. For example, the so-called iron meteorites may contain from 90 to 95 percent metallic iron with an admixture of such elements as nickel, cobalt, copper, sulphur, and others. The only elements thus far found in free form have been carbon, copper, and the gases—hydrogen and nitrogen.

Some of this material from Space contains basic elements in associations not yet discovered in a natural state here. What fascinates specialists ranging from physicists to petrologists is that meteorites are constantly being discovered which have entirely new mineral combinations of familiar elements and different structural patterns. Some see in this unpredictable phenomena that meteorite samples may turn up with some extraordinary composition features which could lead to a major breakthrough on the ideal components for the construction of an artificial space vehicle.

As for size, this cosmic material—recovered or merely located—has varied from tiny pieces weighing only small fractions of an ounce to multi-ton chunks. The largest on record, an iron meteorite impacted near Grootfontein, South West Africa, has a weight calculated in excess of 60 tons and measures 9x9x3¼ feet. Far huger masses hurtling in from Space are responsible for gouging out the great craters which are among the world's weird natural wonders.

Iron meteorites are the most easily distinguishable by amateur searchers because of their weight, although occasionally a hunter for such cosmic material has been duped by a chunk of slag in mining and refining areas.

Stone meteorites recovered have rarely been as large as irons because the silica and other non-metallic elements undergo ablation more readily during passage through the atmosphere and thus lose much of their original mass. Furthermore, the stone variety has a tendency to shatter into multiple fragments upon impact, if not before, and the smaller the pieces the more likely they are to escape the inexpert eye.



As for the stony-irons, they undergo an erosion and pitting process in their atmospheric transit. This frequently lays open to view the contrasting metallic and stony portions of their makeup. The result often is that they are curious looking enough to arrest attention.

Unless weather conditions have a chance to play the villain, most newly fallen meteorites have a distinctive very thin surface coating due to melting as they plunged

You Can Help

Science needs more fallen stars. Consequently the Smithsonian Institution has agreed to serve as a central agency for a continent-wide collection program. Its functions in this work will be to investigate all reported falls, encourage active search for meteorites, inform interested scientists of the availability of new material, distribute samples for research, and keep accurate records.

This service will be centered at the Institution's Astrophysical Observatory, Cambridge, Mass. Airmen are urged to send any information concerning recent meteorite falls to Dr. F. L. Whipple, Director of the observatory, or to Mr. E. P. Henderson, Smithsonian Institution, Washington 25, D. C.

through the atmosphere. This may suggest a crusting or varnishlike finish, often black or grayish in color. Cavities are another clue for identification purposes. Those on what was the meteoric nose in cosmic travel will be tiny but deep, whereas those on the opposite end will be wide but shallow.

Laymen often hold the erroneous belief that meteorites bury themselves deep in the ground upon striking. Actually, the number of recovered meteorites found on the surface is quite large. Atmospheric resistance serves as a braking mechanism, gradually slowing down the rate at which meteorites move, and many end their cosmic journeys with insufficient momentum to break the soil.

Indeed, there are no few cases where meteoritic materials, weighing as much as 10 to 12 pounds, have been able to bury themselves only partially, leaving a portion of the object protruding above ground. A find of such weights, by the way, would be considered quite successful hunting.

Those which do burrow out of sight—subsoil meteorites, they are called—do not make a deep job of it, judging by one series of studies. The average penetration depth for material from five to 14 pounds was found to be under six inches; 15 to 40 pounds, less than 20 inches; 41 to 100 pounds, less than two feet; 101 to 300 pounds, less than 49 inches; 300 to 800 pounds, less than 133 inches.

And these facts suggest another clue helpful to the amateur meteorite hunter. Fresh looking and unexplained perforations in the ground have been leads to the foxholes of recently fallen meteorites.

While any amateur would probably get a bigger thrill in spotting the fall, and locating and recovering one of June's meteorites this year, he need not regard the hobby as something seasonal to be pursued only in months with numerous falls. You could turn up some of this material while spading your garden, come upon specimens in the vicinity of excavations for airfield or missile installations, or in countless other ways where any movement of earth had taken place.

Since USAF personnel are widely deployed around the globe, an alert awareness on their part to the new importance meteoritic material has assumed might very well help boost the recovery rate of specimens.

Here are a few general bits of helpful guidance.

The prairie states have proven good hunting territory. Surface stones or like appearing objects are rare because of the geological character of the terrain. On the other hand, New England and mountain states have a much smaller recovery rate because surface rocks and fragments are so common it would take an expert's eye to spot non-terrestrial materials. Desert or semi-desert country also are likely regions for exploration whereas areas with slag heaps, rubble, or open-cut mining are not.

Field glasses or binoculars are always an asset because many potential meteorites have too faint a light for the naked eye to detect.

Any visually sighted fall should be lined up with relation to some local landmarks—control towers, houses, trees, bridges, etc. Both the time of sighting, the direction in which the object is moving, and how long it remains visible are important for these data will help experts plot the approximate impact area.

In the ZI and at a number of overseas countries civilian amateur astronomy clubs are numerous. They offer another good source of helpful information, and even part-time recruits are welcome during the peak meteorite season.

They also are excellent sources for advice on reference works available to the airman who is interested in reading up on the subject, because they know what literature is written for a beginner. This, of course, holds true for public and college librarians.

What should an airman do if he finds an object he believes to be a meteorite? If his base is near an institution of higher learning, an inquiry there will probably establish whether he is right or wrong. Ditto, if he is located in the vicinity of an astronomical observatory, whether in the ZI or elsewhere. Or if a museum of natural history is handy, he can seek opinions there.

If the find is determined to be or suspected to be a meteorite, it should be sent immediately to the Smithsonian Institution (see box). Good looking and good hunting!

"The fitness of our young people is essential to the strength and progress of our nation. I think we ought to concern ourselves with making sure that our children are fit; that they are concerned with being energetic; that they use their young years not only as spectators but as participants in this life."

President John F. Kennedy

John De Negris sets MATS record of 71 pushups.

OPERATION YOUTH FITNESS

by **DAVE KARTEN, Airman Staff**

USAF's Dynamic Dependent Youth Fitness Program Is Paying Dividends in Physically and Mentally Fit Air Force Youngsters.

THIS MONTH, at U. S. Air Force bases around the globe, nearly a million children, age 6 to 17, will become physically tougher and morally stronger.

At air bases from Thule to Tachikawa, from Nome to Madrid, the USAF youth fitness program will offer these youngsters a wide variety of activities ranging from baseball to ballet; ceramics to swimming. There will be field-day competitions, dance instruction, boy and girl scout troops, Little League baseball, softball, dodge ball, hobby and craft instruction, teen clubs and vacation trips.

Although these youth activities will vary from base to base, the purpose behind them all will be the same: to promote physical fitness and a better moral and emotional climate for USAF youngsters. In regard to moral fitness, USAF chaplains conduct active programs and establish a climate conducive to the development of this vital trait.

The Air Force has good reason for conducting organized youth activities. Military life makes it impossible for most Air Force families to settle in one place for any considerable length of time. Result: the children are constantly uprooted; forced to develop new friendships and new loyalties. Even many adults find this kind of

Catcher Paul Smith stands alert as John Hilker swings in Little League game at Hanscom Field.

oungsters at Malstrom AFB compete in a variation of polo.

Active adult support adds sparkle to programs.

life difficult. For children, it can be a tremendous problem, compounded by the fact that Air Force fathers are often called away on temporary duty. The need for organized dependent youth activities became urgent in 1953 as increased on-base housing focused commander's attention on a problem that promised to become more and more acute. Something had to be done to provide opportunities for the physical, mental, social, and spiritual development of the children of Air Force members. The nature of the military profession made the requirement even more vital than in many civilian communities. To meet the challenge, the USAF instituted the now highly successful Dependent Youth Activities Program.

How well the Air Force is handling its youth fitness program can be seen from a brief rundown of the activities which get into full swing this month and promises to be the "biggest and best yet."

Tachikawa Air Base, Japan, for example, will offer Air Force youngsters instruction in golf, tennis, swimming, archery, ceramics, and painting. There will be courses in Japanese, Hawaiian, and American dancing, singing, bowling, leathercraft, needle-work, model building, photography, and modeling for girls and judo for the boys. Nearby Yokota AB conducts trips to the Nikko shrines and youth hostel, cable car rides to Kegon Falls, boat trips to Lake Chuzenji (Little Fuji). American and Japanese youngsters compete in the Labor Day soap box derby.

The Teen Club at Zaragoza Air Base, Spain encourages members to study Spanish history and culture. Youngsters in the U. K. visit the Edinburgh Festival. American youngsters in Germany take boat trips on the Rhine, tours to historic Rothenburg. The Youth Activity programs at overseas bases provide USAF children with free-time activity in the American tradition, and cement better understanding through joint activities with the youth of the host nation.

Stateside bases will go all out this summer also to make the program interesting, entertaining, and informative. Loring AFB, Maine, will sponsor outings at a lake camp for teenagers. Myrtle Beach will host a Youth Fishing Rodeo for junior Izaak Waltons. Hamilton AFB, Calif., youngsters will visit museums and parks in the San Francisco Bay area. England AFB, La., will have a doll-making and toy-repair project.

To find out precisely how one successful Dependent Youth Activities Program operates, let's look in on the one at Andrews AFB, Md., where Special Services Chief Lt. Col. Lionel Layden hired youth director Karl Edler to operate the Youth Center.

In a corner of the attractive building a 12-year-old named Valerie is attending a meeting of the Sub-Teen Club. Valerie lives eight miles from Andrews AFB. There are numerous activities in the neighborhood where she lives but her parents bring her to Andrews' Youth Center on alternate Friday nights "Because there is no similar club for 12-year-olds in suburban Maryland," says her mother.

Nancy Rose lives in the Married Airmen's Quarters at the base. Her father is an airman in the Andrews AFB hospital. Nancy attends Surratsville High School and enjoys dances and social activities there, but she passes them up when they conflict with a teen dance on the base. "I feel that the teens here have many things in common and that we are all part of a family."

Swimming is accorded widespread emphasis in AF physical fitness programs. Here beginners are taught how to kick.

A freckle-faced 10-year-old named Bill from Morningside, Md., signed up for the base Little League team this season. His dad commutes to the Pentagon every day. Bill's reason for joining: "Some of the fellows told me there aren't any bench warmers in this league."

Nineteen hundred Air Force youngsters were part of the Andrews Youth Activities during the past year. More than half of them live in nearby communities and travel to the air base for the recreation of their choice.

The dynamic Youth Activities program at Andrews is directed by a Youth Advisory Council which includes representatives of all organizations serving youth at the base: the Chaplain, Youth Director, Personnel Services Officer, and the Base Executive. Organization and supervision of the program is supervised by the civilian director and an NCO from Personnel Services.

However, the key to the success of the Andrews Youth Program are the mothers, dads, and other volunteers who work with the boys and girls. Included among them are many airmen college graduates who excelled in sports and recreation. Paid part-time workers are used only where specially trained personnel, like ballet and dance instructors, are required.

The attractive program at Andrews includes: a Youth Center open during the afternoon and evening six days a week. It has a snack bar, dance area, and juke box, a TV room, game room, lounge, and meeting rooms. The center sponsors table game tournaments, teen dances, and trips to points of local interest for the youngsters. The building provides room for dance classes and clubs; houses the Youth Director's office.

Youth sports at Andrews are organized on a year round basis. Little League and Pony League baseball, Junior Olympic Track and Field, and Swimming and Diving Meets are popular during the summer months. Biddie and Junior basketball, and an American Junior Bowling Congress form the winter league activity.

What better way can be devised to build the kind of confidence and self-reliance youngsters need?

There is a full scouting program at the base for Cubs, Boy Scouts, an Explorer Squadron, Brownies, Intermediates, and Senior Girl Scouts. The base also has a Civil Air Patrol Unit, a Sub-Teen Social Club, and a Junior Rifle Club. All have their own adult advisers and leaders; most are affiliated with national youth organizations.

Instruction is offered in just about any activity as long as qualified instructors are available and a minimum of 10 students wish to attend. In some specialized areas—like dancing or judo—the students pay a nominal charge to help defray the cost of a professional instructor. In the "learn to swim" program each summer, instructors are paid from welfare funds. Subjects taught at Andrews include archery, art, ballroom dancing, ballet, baton, ceramics, charm and modeling, choir, dramatics, folk dancing, golf, judo and self defense, music, swimming, tap dance, and tennis.

In addition there are monthly special events for the dependent boys and girls. They range from swim fairs, pet shows, and fishing rodeos to hobby shows and talent fairs at which local TV personalities present the awards.

Emphasis this summer will be on activities which normally receive little attention. Youth officials feel many youngsters don't participate in some of the popular sports because they aren't quite good enough in these highly competitive fields. "However," they point out, "these youngsters may be just as good at sports which are just as worthwhile but less dominated by 'expert' players. They may be interested in volleyball, archery, soccer, horseback, badminton, etc., if the bases can provide these activities."

In addition to competitive sports activities, many Air Force bases annually conduct the Junior Physical Fitness and Proficiency Tests developed by the AAU

Rooftop basketball court at Fuchu AB in Japan bustles with activity.

Bowling is even more fun u interested eye of someone's D

Skillful fingers and nimble minds are developed in this Arts and Crafts class supervised by NCO of Fifteenth AF.

At Tachikawa Community Center young American girls are introduced to cultural joys of Japanese dancing.

for boys and girls 16 to 18 years of age. The tests, designed to motivate teen-agers to increase their participation in sports, are well within the "safety zone" and capacity of the average boy and girl. Physical fitness tests will not in themselves make a boy or girl physically fit, but they do provide an incentive and challenge to them to improve their physical condition once they have the courage to match themselves against the standards, and are brought face to face with their shortcomings. Furthermore, they are less likely to resist measuring their physical capacities against standards than competing against superior opponents. Boys and girls achieving minimum standards are awarded attractive AAU certificates.

Nearly every major Air Force base has a trained youth director working directly under personnel services. Some are airmen who specialized in sports and recreation. Others are full time professional youth directors hired to supervise the youth activities. They work closely with chaplains, parents' groups, organized youth movements, and commanders to provide a balanced program that builds character through physical and mental fitness.

"In the eight years since its inception," says Col. Guy N. Blair, USAF Chief of Special Services, "the USAF Dependent Youth Fitness Program has made good progress. But we still have a long way to go."

As evidence the Colonel cites a series of fitness tests recently taken by 10,000 British children and 8,500 American youngsters in seven major areas. The English boys and girls scored higher in pull-ups, sit-ups, shuttle run, 50-yard dash, broad jump, and the 600-yard run-walk. The only test in which the Americans outdid their young British cousins: soft-ball throw which stems from the American game.

The results emphasized an important fact: that today physical conditioning is perhaps the greatest single need of American children. Many of our youngsters are weaker and flabbier than those in other countries, and are growing softer every year. Their physical fitness—or lack of it—constitutes a grave problem.

Recent studies of more than 7,000 children age 6 through 16, in the U. S., Italy, Austria, and Switzerland showed 57.9 percent of the American youngsters failed in one or more of six basic strength and flexibility tests, whereas only 8.7 percent of the European children failed them. Almost six out of 10 of the American youngsters were found to be physically unfit, compared to less than one out of 10 in Italy, Austria, and Switzerland.

The physical condition of our young people today is even worse than it was during World War II, when almost three million young men drafted for military service were rejected for physical reasons.

Not long ago Springfield College, one of the country's leading physical education schools, gave the *Rogers Physical Fitness Index Test* to 4,000 boys in junior and senior high schools. This test is widely accepted by educators and has been in use since the 1920s. At not one school, the researchers reported, were the boys up to the average of fitness established in previous years.

Combat veterans will tell you that man for man the Japanese infantryman of WW II was a much tougher soldier than his American counterpart. Because of his rugged childhood, he could march farther and endure more privation.

For the same reason the young people of Italy, Austria, and other nations are in better physical shape than American children. In those countries boys and girls still walk or pedal bicycles instead of riding in autos or buses. They have to do chores which machines do for us; and with fewer radios, TV sets and movies, they devote more time to sports.

Goal of the USAF Dependent Youth Activities Program is not only to promote "total fitness" but to establish a more satisfactory moral and emotional climate for its dependent children. Is the Air Force doing this? Nearly a million youngsters of Air Force members in the U. S. and overseas say "Yes."

While the USAF was the first of the armed services to give official recognition to youth activities, the idea is an old one. The knowledge that the physical well-being of the citizen is an important foundation for the vigor and vitality of all the activities of a nation, is as old as Western civilization itself. Beginning more than 2,500 years ago men from all quarters of the Greek world gathered every four years at the sacred grove of Olympia, in the shadow of Mount Comus, to compete in the Olympian games. Winners of the coveted Olympian crowns were greeted as heroes and given rich rewards.

The same civilization which produced some of our highest achievements of drama and philosophy, government and art, also gave us a belief in the importance of physical soundness. From the Romans' *"mens sana in corpore sano"* to the British belief that the playing fields of Eton brought victory on the battlefields of Europe, the message was clear: the physical well-being of the citizen is an important foundation for the vigor and vitality of all the activities of a nation.

The wealth of a nation, it has been said, is in the strength of its young people. In this respect we have been growing poorer each year. The vital Air Force dependent youth fitness program is an all-out effort to reverse the trend.

Last year Air Force expenditures for the worldwide program exceeded a million dollars of nonappropriated funds. Although the figure may go higher this year, many of the activities are rapidly becoming self-sustaining. Dues, voluntary contributions by Air Force families, and special fund-raising efforts provide a large part of the operating money. Nonappropriated funds are used mainly for hiring professional help and supporting new or exceptionally large programs. But money alone won't do the job. Air Force Special Services officials see a need for: Greater recognition of youth needs; More do-it-yourself fund-raising programs; More recruiting and training of volunteers; Total base-population participation.

Members of the Junior Rifle Club at Castle AFB look through the sights under supervision of instructors.

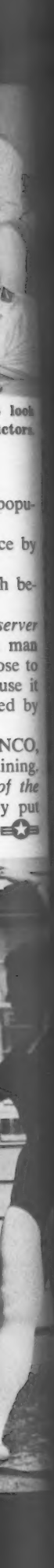
And perhaps most significant of all—acceptance by all parents of their basic responsibility.

They point out that the wholly prepared youth becomes the wholly prepared young adult.

An editorial in the Barksdale AFB, La., *Observer* recently summed it up this way: "A self-reliant man will require a minimum of direction. He will choose to do the right thing at the right time simply because it is the right thing. His choices will not be marked by false starts and suddenly changing objectives.

"This emotionally stable, self-reliant officer, NCO, and airman is the object of Air Force life and training. It is the type of man the framers of the *Code of the American Fighting Man* had in mind when they put into words the principles of military fitness."

Dedicated Air Force wives, like Mrs. Doris Brooks of Andrews AFB, contribute substantially to the success of Air Force efforts to build physical and mental fitness.



AIRMAN'S WORLD

This HOUND DOG is not square, as tests of the sleek SAC missile have already proved. Its cool performance depends on sharp maintenance crews who handle preflight checks on—believe it or not—a "rock and roll" table. The mechanism simulates the pitch and roll of a missile in flight and helps uncover any "bugs" which might emerge. The HOUND DOG is carried by B-52s and can be launched hundreds of miles from target.

BITS OF BLUE

. . . The Surgeon General has announced that during 1960 USAF attained a record low rate of 95 per 1,000 personnel absent from duty during a normal work day. This was the lowest of any of the services and compares with an average of 161 a decade ago.

. . . Secretary of Defense officials recently approved approximately $1.3 million for rehabilitation of Wherry housing at Hill AFB, Utah; Castle AFB, Calif.; and Keesler AFB, Miss.

. . . PacAF has been awarded the 1960 Daedalian Trophy for the most effective aircraft accident prevention program of the year. Maintenance version of the same award was made to the 3500th Maintenance and Supply Group, Reese AFB, Tex.

. . . Death claimed Robert Crawford, composer of the *Air Force Song*, early in March. He had served several periods of extended active duty and was retired from the AF Reserve as a lieutenant colonel.

. . . Harlingen AFB, Tex., graduated the largest class of navigators in the nine-year history of that school recently. The group totaled 170—49 student officers and 121 aviation cadets.

. . . In Spain, the village of La Muela has named a street in honor of Air Force MSgt. Frank Leone in recognition of his community relations contributions during his assignment in the area. He is the first American to be so honored anywhere in the country.

. . . USAF has awarded a $1.8 million contract supplement to the General Electric Co. for production of additional Vulcan guns. The weapon is currently utilized on the B-52H, B-58, F-104, and F-105.

. . . USAF officials have announced sponsorship of a new 18-month dietetic program. Training will be conducted in two phases—12 months with the American Dietetic Association, six months at Air Force hospitals. Graduates will be commissioned second lieutenants in the AF Medical Specialist Corps.

WELCOME ABOARD

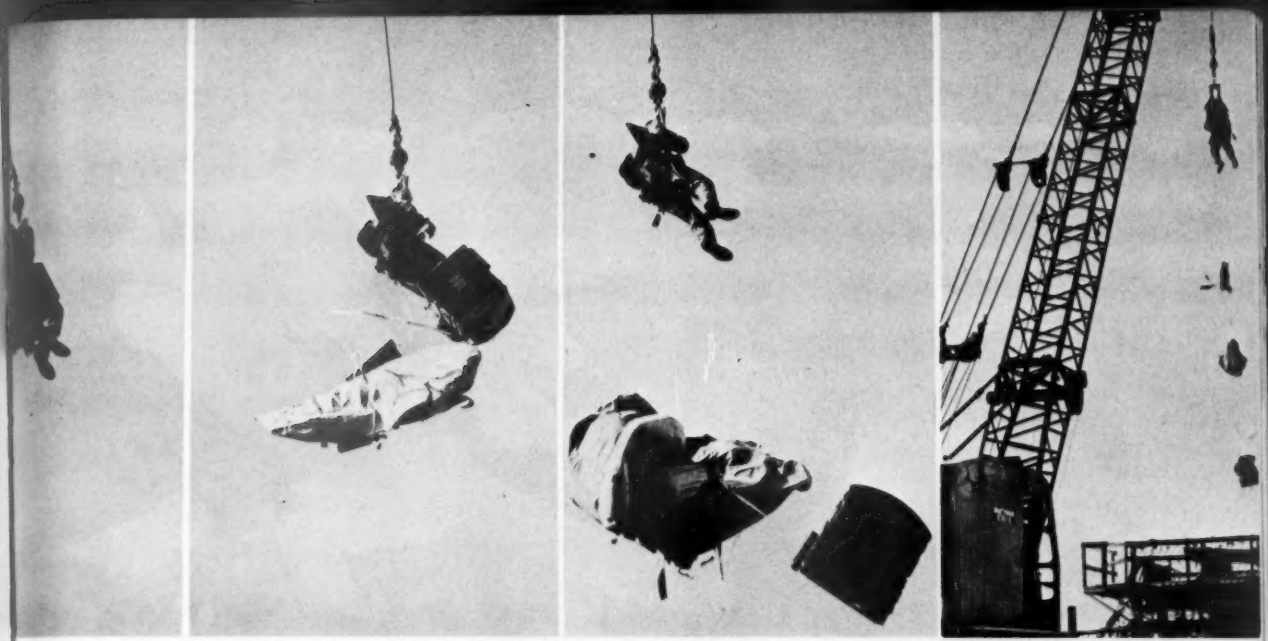
SAC is in the process of welcoming back three squadrons deactivated 12 years ago. Two will join the USAF roster this month, the third, in July. All will be redesignated.

Known as the 577th Bombardment Squadron (Very Heavy) before being temporarily retired in 1949, this unit now becomes the 577th Strategic Missile Squadron (ICBM-*Atlas*). It will join the 11th Bombardment Wing, Altus AFB, Okla., this month.

Also in June, the 569th Squadron returns to the active list and begins conversion. It will be designated the 569th Strategic Missile Squadron (ICBM-*Minuteman*), and will become a part of the 9th Bombardment Wing, based at Mountain Home AFB, Idaho.

Finally, next month, the 578th Bombardment Squadron becomes the 578th Strategic Missile Squadron (ICBM-*Atlas*). It will be assigned to the 9th Bombardment Wing, Dyess AFB, Tex.

PRELIMINARY TESTING of "encapsulated" seats, designed to protect B-70 crewmen should high-altitude ejection become a necessity, has been completed at Hurricane Mesa, Utah. As shown here in rocket sled tests, regular seats convert into capsules under emergency conditions. However, control of the aircraft is still possible from the steel cocoon. Thus the aircraft may make a controlled descent to a safe landing or an altitude where ejection without such protection is possible. If the crew is forced to leave the aircraft above a "safe" altitude, the capsule provides an acclimated environment for the trip down. Booms at the rear extend automatically and act as stabilizers until the landing parachute is released.



TESTING A TRUNKFUL of survival gear, a pilot dangles from a crane during a simulated drop at the Republic Aviation plant. Designed for use with the F-105, the kit contents may be varied according to mission and terrain to be covered. However, in each instance, the package is attached to the pilot by a lanyard to afford him easy recovery of the equipment on landing. Trunks may contain everything from a self-inflating raft to an oxygen system, food packets, radio, fishing gear, and a hunting rifle.

"WIGGLE-WIRE" DE-ICING

The Goodyear Tire and Rubber Co. has been awarded a patent for a unique "wiggle-wire" de-icing element, dubbed Iceguard, which promises to significantly increase system efficiency.

More uniform heating and ice-melting have been produced by the revolutionary construction which relies upon a knitted electrical element. The unit contains 48 wires per inch, each .015 inches in diameter, and spaced .006 inches apart.

Resiliency of the fabric-and-wire unit will allow its use in conjunction with any aircraft surface no matter how sharp its contour. Overall weight of the aircraft is also measurably reduced because of the lightness of the units.

Such Iceguards have proven their effectiveness on Boeing 707 commercial airliners and may become a regular aircraft feature.

PROFICIENCY TESTING

Proficiency testing periods for the current month are June 5-10 in overseas areas and June 12-17 at Stateside bases. Air National Guard and Reserve testing will be conducted throughout the month.

Cycle two, Phase three, will include all eligible USAF personnel in the following career fields: Intelligence (20), Safety (24), Air Traffic Control and Warning (27), Communications Operation (29), Missile and Guidance Control Systems (31), Munitions and Weapons Maintenance (46), Motor Vehicle Maintenance (47), Utilities (56), Transportation (60), Food Service (62), and Personnel (73).

WHO SAID IMPOSSIBLE?

USAF Commendation Medals have been awarded to two 317th Consolidated Maintenance Squadron airmen for completion of a job that was long believed impossible.

The saga began last November when a USAF C-130 turboprop transport was forced to abort a Congo airlift mission after successfully delivering its cargo to the airfield at Entebbe, Ugandi, Africa. A quick inspection of the faulty engine by A2C Donald G. Wilson and A2C Clint A. Ayers disclosed that an engine gearbox had failed. Without it, transfer of power from the engine to the propeller was impossible.

Normally, an engine change would be required before the plane could be returned to commission. The problem was, however, that no engines were available in the immediate vicinity. Days would be lost before one could be flown in from 322d Air Division Hq. in France.

The two airmen began checking around and discovered a damaged engine which had been changed the day before. From this they scavenged an undamaged gearbox. However, this didn't solve all the problems. The "new" piece of equipment had been taken from an inboard engine. Their failure had been on an outboard plant. The two were rigged differently.

Undeterred by this myriad of problems, the lack of proper equipment, and the knowledge their goal was generally considered impossible, the two set about their task with determination. They devised, improvised, substituted, and sweated. Less than 24 hours later, they called the plane into commission, rode the required test hop and returned to France.

The awards were presented recently by Col. Tarelton H. Watkins, division commander, in special ceremonies at Evreux-Fauville AB.

---AND FAREWELL

On the last day of this month, one of USAF's best-known bases—Mitchel AFB, N. Y.—will revert to caretaker status, marking the end of a brilliant history.

A military installation for more than 175 years, the base obtained its current name on July 16, 1918, in honor of the first fusion mayor of New York City, John Mitchel, who had been killed in a military air accident earlier that same year.

It was not until 1920 however, that it was classified as an "active flying field" although military flights had been made from the base at earlier dates when it had been known as Mineola Field No. 2.

Since mid-February of this year, various phases of operations at the Long Island base have been closing down or transferring to other sites across the nation. Barring late changes or waivers in deadlines, Mitchel will be manned by no more than three dozen military and civilian personnel at the close of the fiscal year.

FIRST OF 30 C-135A jet transports, recently named *Stratolifter*, will be delivered this month by the Boeing Airplane Co. Developed from the service-proven KC-135, the transport's exterior and interior dimensions will correspond with those of the tanker. However, modifications will eliminate the external boom. MATS will use the C-135A for cargo, troop carrier, and medical evacuation missions. The *Stratolifter* will have a maximum payload of 64,000 pounds and a maximum range of 5,700 miles.

CHEATING THE KILLER

AB William Pascoe can testify that an automobile is potentially dangerous even at a complete standstill.

Late last winter, the 18-year-old left Altus AFB, Okla., for a date in a nearby town. It lasted later than usual, and the tired airman wisely decided to catch a nap in his car before returning to base. He asked the girl to wake him early.

The night was cold. Pascoe left the motor running and the heater on. Came dawn and the girl was unable to awaken him.

He was rushed to the local hospital where doctors were unable to revive him despite reaction to stimuli. An ambulance whisked him to the Altus base hospital where Lt. Col. Bradley Prior, hospital commander, checked for carbon monoxide poisoning.

The lab report disclosed 40 percent monoxide saturation—25 to 30 percent is normally fatal. Medical records indicated only one known recovery from such a lethal dosage.

But, apart from the danger of death, permanent nerve or brain damage seemed certain.

Capt. Rachmel Cherner, a staff physician, recalled a similar case in which hypothermia—reduction of normal body temperature—had averted death. The process was initiated, and the long wait began.

By next morning, it was apparent death had been cheated, but the possibility of nerve or brain damage remained. Several days passed. Finally, the staff announced there was no evidence of such damage.

Despite their success, doctors were quick to re-emphasize the dangers of such poisoning. They join ground safety personnel in stressing: "Don't drive when tired, but sleeping in a closed car with the motor running is not the answer either."

Air Age Library

MISSILES, ROCKETS AND SPACE

More than a dozen of the nation's leading aviation medicine authorities have contributed to *Human Factors in Jet and Space Travel.* Dr. S. B. Sells and Lt. Col. Charles Berry, both contributors, collaborated in editing this probing medical-psychological analysis. (The Ronald Press Co., $12.00.)

Shirley Thomas has completed the first volume of what promises to be a distinguished series titled *Men in Space.* This entry details the lives of 10 contributors to the space program including USAF's Lt. Gen. Bernard Schriever, Col. Charles E. Yaeger, and Col. John P. Stapp. (Chilton Co., $3.95.)

HISTORY

The first volume of a new William Green series on WW II aircraft has been released by Hanover House. This one treats with aerial war's "glamor" planes, is titled *Fighter,* and includes entrants from every combatant nation of the 1939-45 conflict. ($2.75.)

Doubleday and Co. is the publisher of the new Mel Hunter effort *Strategic Air Command.* This story of intercontinental bombers offers a vivid account of the machines and the unsung heroes of our bomber command during the years of the cold war. ($4.95.)

The Man Who Rode the Thunder is a dramatic first-person re-creation of Lt. Col. William H. Rankin's ejection from a flamed-out jet fighter and his subsequent parachute descent through a raging thunderstorm. He also recounts portions of his Marine Corps career. (Prentice-Hall, $3.95.)

USAF's Capt. Wallace L. Brown narrates the tale of his brief aerial combat career in Korea and 31 months in a Chinese Communist prisoner-of-war camp after he was downed in *The Endless Hours.* It provides a gripping account of brainwashing. (W. W. Norton, $3.95.)

FOR THE TEENS

Countdown: The Story of Our Missile Bases, Carroll B. Colby (Coward-McCann, $2.50.)

Fighter Parade, Carroll B. Colby (Coward-McCann, $2.50.)

Bomber Parade, Carroll B. Colby (Coward-McCann, $2.50.)

Discoverer: The Birth of a Satellite, Michael Chester and Saunders Kramer (Putnam, $2.50.)

Early Warning, Robert Wells and C. R. Whiting (Prentice-Hall, $2.95.)

Flights That Made History, David Cooke (Putnam, $2.50.)

Messages From Space, Clive Davis (Dodd, Mead, $2.75.)

You Ask It

In answer to numerous requests, here is a rundown on new regulations and recent changes in areas of widest USAF interest.

AFR 34-52, 3 February 1961, *Operation Bootstrap.* Contains important changes in length of TDY status for applicants, outlines tuition assistance and policies and procedures for application.

AFR 35-54 B, 16 January 1961, *Rank, Precedent and Command.* This change incorporates important corrections and deletions in the basic regulation.

AFR 35-67, 19 January 1961, *Line of Duty Determinations and Investigations.* Explains how and when to make a line of duty determination and the method of completing proper supporting documents.

AFR-361, 7 February 1961, *Personnel On-the-Job Training Evaluation Program.* Outlines procedures for establishment of an evaluation program for OJT and related programs.

AFR 36-31A, 14 March 1961, *Appointment of Officers in the Regular Air Force (Veterinary and Medical Service).* Contains the latest revisions to the basic regulation, stressing temporary grades and background requirements.

AFR 36-40, 13 March 1961, *Officers Control Procedure.* Establishes procedures to identify and initiate control action on officers and warrant officers whose conduct or duty performance requires special attention.

AFR 36-95, 27 January 1961, *Academic Scholarships and Fellowships.* Explains USAF policy, criteria for acceptance, eligibility requirements and methods of application for officers desiring to compete for publicly announced scholarships or fellowships.

AFR 50-12, 13 March 1961, *Extension Course Program.* Prescribes eligibility requirements and establishes enrollment procedures for ECI courses.

AFR 53-3A, 7 March 1961, *USAF Officer Candidate School.* Includes several important changes in policies, procedures and other key areas of the basic regulation.

AFR 53-10B, 17 February 1961, *Appointment to the United States Air Force Academy.* Incorporates important changes and deletions in the basic regulation.

AFR 53-13A, 18 January 1961, *Nomination of Enlisted Men to the United States Military Academy.* Contains the latest revisions to the basic regulation.

AFR 145-10, 27 February 1961, *Use of Military Personnel in Commissary Sales Stores.* Outlines policy regarding assignment of active duty personnel to retail activities of commissary sales stores.

AFR 205-1A, 15 March 1961, *Safeguarding Military Information.* Provides a major revision to the basic regulation concerning classification, downgrading, safeguarding and related areas in the security program.

READ YOUR COMM

TO ALL WHO SHALL SEE THESE PRESENTS, GREETINGS:

Know you that reposing special trust and confidence in the patriotism, valor, fidelity and abilities of _____, I do appoint him _____ in the United States Air Force Reserve, Air Force of the United States to date as such from the __day of__19__. This officer will, therefore, carefully and diligently discharge the duties of the offices to which appointed by doing and performing all manner of things thereunto belonging. And I do strictly charge and require those officers and other personnel of lesser rank to render such obedience as is due an officer of this grade and position. And this officer is to observe and follow such orders and directions from time to time as may be given by me or the future President of the United States of America or other superior officers acting in accordance with the laws of the United States of America. This commission is to continue in force during the pleasure of the President of the United States of America for the time being under the provisions of those public laws relating to the officers of the Armed Forces of the United States of America and the component thereof in which this appointment is made. Done at the City of Washington, this__ day of _____ and in the year of our Lord one thousand nine hundred _____ and of the independence of the United States of America the 185th by the President.

Secretary of Air Force

Lt. General, USAF

Deputy Chief of Staff, Personnel

BECAUSE 20 YEARS AGO I sat in a theater at Kelly Field, a theater m the same as this, for the same reasons and with the same hop anxieties, and reliefs that beset you on this day, I will be brief. I kn that you have your orders, or will have shortly; that you are anxious get on your way. I recall that some gray-haired colonel made a pres tation to us on our graduation day also, but I cannot recall his na or what he said. So it must be apparent to you that I am sympathet

There are, however, a couple of thoughts which my 20 years military flying experience have left with me and which I would like pass on for your use. On that day 20 years ago I received the docume commemorating the ceremony and my commissioning certificate; h riedly glanced at them and never gave them another thought until years later. I was in too much of a hurry.

Had I studied one of these particular documents carefully, I confident that the appreciation of the trust placed upon me would h been greater, and my efforts to do what was expected of me would h been expended with greater energy and more accurate direction. I referring to the commissioning certificate.

About two years ago I became fascinated with the unusual turn phrases and have gone so far as to do considerable research into background of the document. First let me read the opening senten I ask you to carefully consider the words chosen. While this docum probably had its origin in early Anglo-Saxon history, it is said by so to have been rewritten by Thomas Jefferson. This may have been t in order to apply it to our new armies at that time. It sounds like h

Folklore asserts that it originally contained the word "prudence" remained unchanged until the days of the Civil War when Mr. Linc deleted the word. Other folklore has it that his reasons were pur speculative but it was presumed that he did so because of trouble w some of his generals. The National Archivist in Washington tells that a spot-check examination of various commissioning certificates the 1775-1910 period indicates that many changes occurred in wording of the preambles of these certificates. The preamble usu stated that ". . . reposing special trust and confidence in the patriot . . ." and then such words as "conduct," "fidelity," "valor," and "a ities" were used to complete the statement.

A search of General Washington's commissioning certificate as Co mander in Chief of the Army of the United States dated Philadelp June 19, 1775; as Commander in Chief of all the Armies raised o be raised dated July 4, 1798; and of John Paul Jones as Captain of United States Navy dated October 10, 1776, failed to reveal the use the word "prudence." Also, a search of the Archives failed to disc that President Lincoln tampered with the document. As far as I determine, the document which you receive today is almost identical that received by General Washington in 1775.

I believe that the words chosen have strong meaning. I believe you have demonstrated valor and ability and loyalty. Without this President could not repose special trust and confidence upon you. Re tively few have the ability to earn this document.

The basic source of the authority vested in the commissioned offi is the Constitution, which states that Congress has the power to prov for the common defense of the United States. In exercise of this pow Congress enacts whatever laws are necessary to establish military for and defend the nation. Also in the Constitution is the provision that President be the Commander in Chief of the Armed Forces; that he

SSION

by COL. VERNE BIVIN
Deputy Commander 1707th Air Transport Wing (MATS),
Tinker AFB, Okla.

that all laws are faithfully executed; and that he commission all officers of the United States. In commissioning an officer, therefore, the President is making a direct grant of authority that is necessary to fulfill his responsibilities. This is evidenced by that part of the commission which states: ". . . and I do strictly charge and require those officers and other personnel of lesser rank to render such obedience as is due an officer of this grade and position."

Such broad authority must be tempered by sound judgment, which can be expected of those who have been commissioned because of their valor, fidelity, and abilities. As a safeguard, however, the Constitution and directives place certain restrictions on what an officer can order a subordinate to do and upon other actions that he can take. The Fifth Amendment, for example, provides that no person be deprived of life, liberty, or the pursuit of happiness without due process of law.

As a general rule, only such authority is vested in the commissioned officer as will give him direct support in carrying out his assigned duties and in fulfilling his mission, which includes maintaining the efficiency and morale of those he supervises. His actions must not, in themselves, be illegal.

In addition to direct authority, each commissioned officer also has certain moral authority. This evolves from the discretion expected of him by virtue of the fact that he is commissioned. In other words, the officer is expected to do what is right, proper, and necessary. When he has no directive or precedent to follow, he must be prepared to give whatever orders are required by the circumstances.

With direct and moral authority comes the responsibility inherent in the profession. Upon being commissioned in the Air Force, an officer incurs a lasting obligation to cherish and protect his country, and to develop within himself that capacity and reserve strength which will enable him to serve its arms and the welfare of its citizens with increasing wisdom, diligence, and patriotic conviction. This is the meaning of his commission. It is not modified by reason of any assignment while in the service, nor is the obligation lessened on the day an officer puts the uniform aside and returns to civil life.

Having been specially chosen by the United States to sustain the dignity and integrity of its sovereign power, an officer is expected, for as long as he may live, to maintain himself and to exert his influence so that he will be recognized as a worthy symbol of all that is best in the national character. In this sense the trust imposed upon the highest military commander in the land is not more than that placed upon the newest second lieutenant. Nor is it less. It is the fact of commission which gives special distinction to the man and in turn requires that the measure of his devotion to the service of his country be greater than other citizens.

Sometimes I think that the words of the officers' commissioning certificate should perhaps be applied to the people of all the free nations. As world conditions have culminated over the ages to a period in time that the civilian populace at large throughout the world is in perhaps as much, or more, danger than the military force, then it would seem to me that the civilian populace of the world must strive to deserve having such words applied to them. But that is beyond your span of control and mine.

You and I, as airmen, must assume the sometimes awful responsibilities that are the inherent lot of airmen by putting to work our integrity, abilities, valor, and fidelities in order that our peoples who are unable to protect themselves may be protected. That is your charge. I strongly advise you to take this document before the next few days have passed, read it in a quiet corner where you may not be interrupted, thoroughly digest the words, and if you understand and appreciate the trust reposed upon you by having done so, you will have become a better officer at that moment.

As to my promise to be brief, other than enjoining you to maintain always the deepest sense of personal responsibility, I have searched my mind and my 20 years for one word which will help you in doing the job before you. You will find that flying the aircraft, which you are now able to do, will become merely a part of your responsibilities as an officer. You will find yourself assigned tasks for which you have had no training but which you will be expected to accomplish correctly and immediately. You will wish that you had had legal training, management training, medical training, financial training, and there are times when you will even search the Bible to come up with the answers. So that one word that I have chosen—the meaning of which I believe will aid you more, if you apply it, than any other in any language—is enthusiasm.

I tell you that it does not matter what the assignment is, if you attack it with enthusiasm and demonstrate that enthusiasm in a manner that those around you will catch the disease, so to speak, I will guarantee that whatever task is at hand will become easier. On the other hand, if you do not attack your task with enthusiasm, you may not get it done correctly or on time.

I am a replica of the gray-headed colonel of 20 years ago, now dead or retired. I hope that I have done a better job than he did. I hope you will remember that you have been especially selected because you are good quality and that it is your job to lead and direct those who lack the quality that you possess. I wish that I could rewrite your commissioning certificate, adding the word "enthusiasm." I cannot do that. However, for the aggrandizement of yourself as an individual and humanity in general I also charge you to apply enthusiasm to all your actions. Thank you and good luck.

June 1961

From an address to the graduating cadets of Class 61-E, advanced pilot training, Vance AFB, Okla.

UNITY FOR VICTORY

by DAVE KARTEN, Airman Staff

IN USAF'S AIR-GROUND OPERATIONS SCHOOL, THE ARMED FORCES LEARN THE MEANING OF JOINT AND COMBINED OPERATIONS

THE TIME WAS SPRING 1945. The place was Germany. The occasion was the climax and breaking point of the war in Europe. Germany was finished—there was no doubt about it. Her legendary Rhine barrier was breached in five growing bridgeheads. A storm of steel and fire was building up in the east. Defeat was staring the Third Reich in the face and the Germans had nothing with which to stave it off.

The crust of German resistance behind the Rhine was not yet broken in telling depth, but it was crumbling under the knifings of Allied armies and airpower.

In their expanding sectors east of the Rhine the Americans were speedily turning to fluid movement. Lt. Gen. George S. Patton's Third Army was on the loose. Lt. Gen. William H. Simpson's Ninth Army had slashed a quick opening after its crossings downriver from Duisburg, and cut a bypassing path north of the Ruhr Valley's complex of industrial cities. Lt. Gen. Courtney Hodges' First Army had begun to burst the seams of its beefed-up bridgehead along a 35-mile front.

Front reporters flashed the magic word: breakthrough. The Allies began to draw the noose fiddle-string tight to encircle the Ruhr, Germany's richest industrial area, and with it 40,000 of Hitler's best remaining troops. Above them the Air Force ruled the skies, but here and there the Germans offered resistance with their best armored divisions.

On the Ninth Army front a forward controller scanned the skies to the west. He was waiting for the air support that was to knock out a German "Tiger"

tank and an ".88" holding his part of the spearhead pushing into the Ruhr Valley.

When the flight of P-47 *Thunderbolts* roared overhead the lieutenant directed their dive bomb attacks on the enemy strongpoints by radio. A direct hit shattered the ".88." The "Tiger" pulled out of the fight.

"Good strike, Whippet lead. Hold your fire, we're moving forward."

"Roger, Snowflake. Call us again. Anytime."

Close coordination and teamwork during World War II opened holes for knife-like Allied thrusts through North Africa, up the Italian boot. It provided column-flank protection for Patton's sweep across France.

By war's end the air-ground team was a smooth operation. But victory was followed by rapid demobilization. The greatest military machine ever assembled was disassembled. Air-ground operations were all but forgotten.

And Then Again

But not for long. Before dawn on Sunday, June 25, 1950, the North Korean Communists attacked the Republic of Korea. Its political purpose: to unify all Korea under Communist domination. The military objective: to capture and control South Korea.

Far East Air Forces (FEAF), the air component of the United States Far East Command (FEC) was in action over South Korea less than eight hours after the U. N. voted to intervene.

On June 29, after the Air Force received the green light, it directed a concentrated effort against North Korean airfields. By the end of July, FEAF's destruction of enemy aircraft reduced the North Korean air force to a token force of approximately 18 serviceable aircraft. Control of the air had been gained with a minimum of effort and loss on our part.

But as the conflict developed in Korea, we faced a war in which the air's prime mission was the support of ground troops on the ragged edge of the peninsula. Whenever our Air Force was called upon to clear the way, knock out an enemy strongpoint, or remove a troublesome tank, it came through. The close-support air strike was *where* the frontline soldier needed it *when* he needed it.

Even so it became evident that the hard lessons of air-ground coordination learned in WW II would have to be relearned and passed on. There was an obvious need for "togetherness" in the combat zone.

A Need for Training

At a Joint Air-Ground Operations School, established in June 1951 at the leased Highland Pines Inn, in Southern Pines, N. C., Army and Air Force officers were taught, in a fast five-day indoctrination course, how to integrate and coordinate the combat capabilities of air and surface forces. New techniques and means of control were developed by the school's staff of Army and Air Force instructors. Methods of streamlining battle zone communications were introduced and classes learned the mechanics of airlift support.

This school is today located at Keesler AFB, Miss. It teaches air-ground and joint operations to key officers of all branches of the armed forces of U. S., NATO, SEATO, and Latin America. The joint faculty of TAC and USCONARC (U. S. Continental Army Command) instructors, and one Navy-Marine representative, are highly trained, handpicked officers. Most are combat experienced veterans; all are authorities on the subjects they present.

The school offers two courses of instruction—a two-week Combat Operations Course for general and senior field-grade officers, and a three-week Combat Operations Specialist Course for officers who will operate the air and ground tactical operations posts.

The two-week Combat Operations Course for the higher ranks is directed mainly at teaching procedures and techniques in a given battle zone. It might seem at first glance that employment of tactical air would have changed little since World War II and Korea, but this is not so.

The ability of jet fighter bombers to cross oceans in a matter of hours, and the amazing technological developments in communications, have altered command and control procedures and capabilities greatly.

A World War II theater commander usually had his troops and aircraft in the theater before he even dared think about committing them to battle. Today, both troops and aircraft can be flown from the United States to any place in the world quickly—but to do so requires a degree of planning, practice, and timing unprecedented in past history.

The two-week course at Keesler is the hone that puts a razor edge on these operations. It develops the split-second planning capability so essential to joint and combined operations.

"If we are to be ready for general and small or limited war," the instructor reminds students, "we must first develop the necessary teamwork between the U. S. and our Allies—before a war starts. That's why TAC, with its Composite Air Strike Force, and the Continental Army Command, with its Strategic Army Corps, continually exercise their forces in periodic joint maneuvers. Operations *Big Blast, Pine Cone, South Wind* and *Trapline* are good examples."

At the school, these operations are constantly studied and evaluated in lectures, conferences, and panel dis-

cussions. A practical exercise covers all types of forces and situations in a CASF-STRAC, Navy-Marine operation. In a nutshell, the comprehensive two-week session gives senior combat officers of all services needed updating in organizing joint combat operations.

Specialists in Combat OPs

Complementing the senior officers' course is the three-week Combat Operations Specialist Course which trains selected U. S. and Allied officers in the nuts and bolts of close air support for frontline troops. It spells out the details of command and control facilities of the Army Air-Ground System.

Take, for example, the Air Operations Center, which is Air Force operated in the combat zone. Korea proved the worth of this unit. It is the Command Post of the Tactical Air Force Commander from which he controls all of his tactical air weapons and their communications and electronics system called Tactical Air Control.

The Air Support Operations Center is a small operations detachment of the Tactical Air Force. It works in the field with the ground forces, handling right on the spot their requirements for close air support and air reconnaissance. It is co-located with the Army's Tactical Operations Center which also includes a fire support coordination element.

It is in the field where the fighting is going on that coordination in close ground support can mean the difference between victory and defeat. The curriculum of the three-week course covers the types and capabilities of combat weapons, particularly as they relate to specific enemy targets.

"In this course," explains Maj. Edward F. Izor, World War II ace and one of the instructors, "we get a lot of young officers who are specialists in their own fields but have little feeling or appreciation of what is going on in the other services. We show them how the other services directly or indirectly affect them in combat. We give these officers a full rundown of the weapons, aircraft, munitions, and equipment, and describe the classical system in which they may be employed."

When an Air Force officer finishes the specialist course, he can effectively perform special functions in the Air Operations Center and the Air Support Operations Center. If in the future he is assigned as a Forward Air Controller, he will know the Tactical Air Control System, the Army Air-Ground System, and the

responsibilities associated with FAC duty. The Army student is likewise prepared to perform special functions in the Army Operations Center and the related Army Ground System.

In the heat of battle, the prelude to a rain of death on enemy targets is the staccato voice of the Forward Air Control who himself may be under constant fire.

"Blue Bird One, this is Flashlight. Target dead ahead one mile."

"Roger, Flashlight."

A plume of smoke rises, marking the strongpoint.

"On target, Blue Bird One. Note Blue Birds Two and Three just to the left and right of the smoke."

Three fighters roar down, rockets streak for the target. Flame engulfs the enemy only a few hundred yards ahead of the friendly forces. Miscalculation could be disastrous, and certainly the Air Force officer crouched on the ground with his radio—this Forward Air Controller—would rather be in the air. But without him and his training, such close support work would be virtually impossible.

The course accents the vital nature of these life and death functions. After a familiarization phase which covers concepts, doctrine, techniques, and procedures of integrated action, it moves into the practical work—problems, map exercises, and seminars. Here students learn the detailed functions and working relationships of people in operations, intelligence, and communications agencies of both Air Force and Army systems.

Out of the Classroom

After the lectures the student gets into realistic, simulated combat situations and exercises. In the Air Oper-

In "fighting" limited wars, tailored with realism, students grasp value of coordination.

Students learn the principles of combined operations with officers of other Free World nations. The key to allied success is teamwork.

Working in harmony on deployment exercise with members of another service, student soon learns that his neighbor has no horns or hoofs.

how joint use of available forces can get the timely and accurate intelligence required in modern warfare. The end result is a new overall appreciation of how all the services can work together to accomplish the common goal—the most effective use of available weapons.

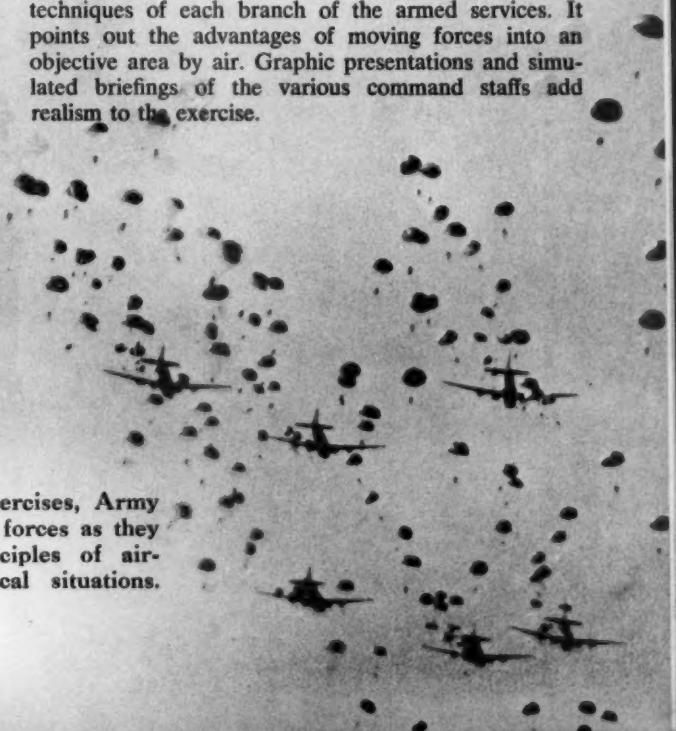
Practical problems deal with employment of Strategic Army Corps units and a Composite Air Strike Force in joint operations. The student studies the employment of this versatile, highly mobile combat team. He learns how to conduct combined operations with other Free World fighting forces. Teamwork is the key.

In a hypothetical small war situation *(Exercise Back Bay)* the student sees a complete reproduction of a tactical problem. It begins with a request for military assistance from a small friendly nation, continues through deployment of U. S. forces, "show of force" operations, the assault and seize phase, exploitation phase, and the wrap-up and redeployment phase. Forces involved include Tactical Air Command's Composite Air Strike Force, U. S. Strategic Army Corps, and U. S. Navy and Marines.

Back Bay underscores the coordination and cooperation necessary to insure the success of joint operations. It demonstrates the newest tactics, equipment, and techniques of each branch of the armed services. It points out the advantages of moving forces into an objective area by air. Graphic presentations and simulated briefings of the various command staffs add realism to the exercise.

ations Center, for example, he learns firsthand how the air commander allocates available air reconnaissance. He sees the Air Operations Center make a number of sorties from specific units available to the Air Support Operations Center. The student observes firsthand how Control and Reporting Centers are given scramble authority over aircraft and missiles on air defense alert.

Tactical reconnaissance is a special subject in itself. There are, of course, approved techniques and procedures for planning and employing tactical air reconnaissance forces, and the instructors strive for a basic understanding and a common language that will enable key officers in any service to communicate easily with their counterparts in other services. With this as a basis, they go into reconnaissance requirements, and the different capabilities of each service. Students participate in training exercises which forcibly demonstrate just



In frequent joint training exercises, Army and Air Force units combine forces as they apply the theories and principles of air-ground operations to practical situations.

Army students become familiar with the capabilities of aircraft, such as the versatile F-105 *Thunderchief*, TAC's new first-line fighter bomber.

"To win—or lose"

In *Exercise Jamesway* students "fight" an air-ground battle in the European theater. "The First Tactical Air Force is working in coordination with the Fifth Army Group composed of the First, Second, Third, and Fourth Field Armies," the instructor tells them. "This afternoon at 1300 *Exercise Jamesway* will begin. Air Force students will man and operate the First Tactical Air Force Air Operations Center and one of its four Air Support Operations Centers. Army students will man and operate the Tactical Air Support Section of the First Field Army's Tactical Operations Center.

"Gentlemen, this is *your* battle to win—or lose."

Perhaps one of the school's most important functions is to get people of the different services together, to let them see that the guy in the different colored suit has neither horns nor hoofs.

The Air-Ground Operations School is run by the Air Force under Tactical Air Command jurisdiction, but the faculty of combat veterans is split between the services.

If student critiques are any criterion, the faculty is one of the best in the business. The majority of the students agree the courses are interesting, informative, well prepared and presented. They especially like the school's ingenious training aids which range from rear projection color slides and movies to blacklight fixtures, magnetic slap-ons and flippers, electrically lighted colored silhouettes, flaming guns, mechanically moving airplanes, men and tanks.

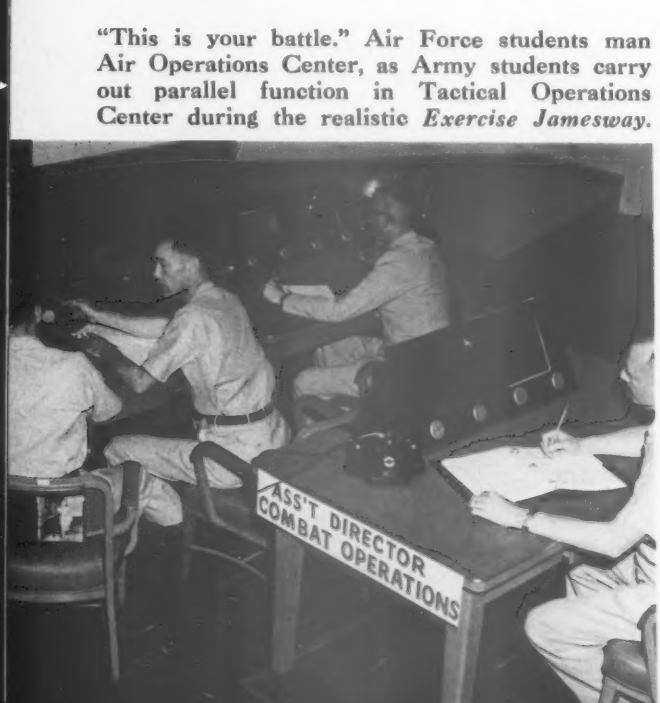
Perhaps the value of the joint school is best summed up by a lieutenant who observed, "Some Air Force personnel didn't understand the problems and complexity of a battle area. A few of the Army students had only a vague idea of how, when, and under what conditions air support can be given. The course was a revelation to all of us. We came away with a better understanding of air-ground and joint operations."

"The teachings within the school," says Brig. Gen. James O. Guthrie, the school commandant, "focus on the joint and combined operations necessary to achieve the greatest utilization of weapons and manpower. The integration of these forces is dependent upon cooperation and coordination exercised by the participating organizations. We of the Air-Ground Operations School are able to provide the background knowledge upon which air, ground, and naval cooperation and coordination must be built. The skills and techniques of air efforts are harmonized with those of the ground for the purpose of reaching a common goal—with preservation of a free world.

"The state of world affairs today requires full assurance that combat commanders and staff officers of all services have a workable understanding of the command and control systems which are available to aid them in conducting joint combat operations. The USAF Air-Ground Operations School, under Tactical Air Command, is dedicated to the job of providing this education to produce understanding of service capabilities and full teamwork between our military forces in war."

A sign over the general's desk succinctly sums up the school's philosophy: "Strategic and tactical planning must be completely unified, combat forces organized into unified commands, each equipped with the most efficient weapons that science can develop, singly led and prepared to fight as one, regardless of service."

"This is your battle." Air Force students man Air Operations Center, as Army students carry out parallel function in Tactical Operations Center during the realistic *Exercise Jamesway*.



LETTERS TO THE EDITOR, continued

Sir: Civilians read THE AIRMAN, too. I'd like to offer congratulations to Lt. Col. C. V. Glines for his *Saga of John Silver* in the March issue. My eyes were not dry after I had read less than half of this story. Please, let's see more of this type. Also, I enjoy the many other stories and articles which you feature. Congratulations on a fine publication.

Ethel G. Carlson
McChord AFB, Wash.

★ ★ ★

. . . And A Few Corrections

Sir: Your attention is invited to an incorrect reference noted in conjunction with the photographic sequence which appeared on pages 23-26 in your March issue. Correct identification of this division is Lockheed Missiles and Space Division.

W. P. Crenshaw
Sunnyvale, Calif.

Sir: In the March issue of THE AIRMAN, you published a picture of the D188A. The cutline states that this single-place fighter utilizes six turbojet engines—one mounted in each wing tip, and four in the fuselage. I believe you will find there are two in each wing tip and two at the rear of the fuselage.

Thomas L. Dail
Cambridge, Md.

• *Reader Dail is correct. The original release received in this office was incorrect. Before we discovered the error, the magazine had already gone to press.*

★ ★ ★

Some Aren't Errors

Sir: The X-15 which you pictured on page 11 of the March issue is not slung from a B-52 wing as you indicate. I contend the plane shown is a KC-135. Am I correct?

MSgt. James McClure
APO 864, New York, N. Y.

• *Reader McClure is not correct. As noted in the story, both of the B-52s assigned to the X-15 project have been specially modified in order to perform their role. One of these modifications includes the changes in the wings which Sergeant McClure questions.*

Sir: In Sergeant O'Doherty's article on page 45 of the March issue, he states that "No young man with the proper growth potential has been denied admission to the career force." I say this is incorrect and cite my own case as an example. I declined to extend my enlistment in February 1960. Now I have decided I wish to re-enlist and this right has been denied me. Doesn't this contradict his statement?

A1C Anthony Sanner
APO 323, San Francisco, Calif.

• *To the contrary, this case only supports Sergeant O'Doherty's statement. Under the current provisions of the 55/45 program, qualified first-term airmen who decline re-enlistment receive no second choice. By Airman Sanner's own admission, he declined this opportunity. Thus, the choice not to continue was his, not USAF's.*

★ ★ ★

Watch It!

Sir: I think you may have included a misleading statement in the article *How You Can Save $$$ on PCS* in the March issue. Use of guest houses can lead to loss of quarters allowance and actually cost more than staying in a motel or hotel.

SSgt. Hector B. Garcia
APO 845, New York, N. Y.

Sir: Individuals forfeit quarters allowance for any portion of a day spent in government quarters. Consequently, an overnight stay in a guest house could result in loss of two days' quarters allowance.

Lt. Col. Virgil L. Phipps
Paine Field, Wash.

Sir: I have had occasion to utilize a number of guest houses in the past several years and would like to correct a couple of "overstatements" which have crept into your article. For example, although I do not deny that they probably exist, I have never found a guest house which was Exchange-

operated. Therefore, I would like to challenge the statement that "most" fall within this category. I think the majority are government quarters. Secondly, with regard to the loss of quarters allowance, a normal overnight stay in a government-operated guest house, while not maintaining a permanent home at a duty station, will cost you quarters allowance for the calendar days on each side of the 2400-hours mark. Normally, in addition to this loss of quarters allowance, you will also have to pay a service charge for each person utilizing the facilities.

Maj. D. J. Maxwell
APO 123, New York, N. Y.

★ ★ ★

Answer to an Answer

Sir: With regard to the inquiries in the *Letters to the Editor* department of the February issue regarding dislocation allowances, I should like to quote Paragraph 9003-3, *Joint Travel Regulations*. It states that payment "from home or from place from which ordered to active duty, to the first permanent duty station upon appointment, call to active duty, enlistment, re-enlistment or induction" is prohibited. A test case was sent to the Finance Center with regard to graduates of service academies. The reply stated that the manual included, but was not limited to, graduates of these institutions.

Lt. Jerry Larson
Sheppard AFB, Tex.

AIRPOWER IS DECISIV

The "forgotten" northern Italian theater reserved for itself the distinction

ON APRIL 1, 1943, Raymond Larry Knight entered Texas A. & M. College as an aviation student. The move climaxed five and a half months of waiting and preparation for flying training for the eager 20-year-old Texan.

Only a few days more than two years in the future, Lt. Raymond Knight, his flying dream and destiny fulfilled, would die in the remote mountain fastnesses of northern Italy.

Ray Knight joined the Enlisted Reserve Corps in mid-October 1942 and was called to active duty late the following January. During the next few weeks, he underwent basic training at Sheppard AFB, Tex.

Following the five-month training period at Texas A. & M., Knight was appointed an aviation cadet in September 1943. The usual pre-flight, primary, basic, and advanced followed in rapid order and, on May 23, 1944, he was graduated from pilot school and commissioned.

Once again, Lieutenant Knight began a series of training experiences, designed to polish his newly won skills and qualify him for combat.

Finally, in November 1944, he was ordered to duty with the 346th Fighter Squadron, 350th Fighter Group, based in Italy. He reported on December 7, 1944, three years to the day since the United States had been drawn into WW II.

The unit to which he reported was one of the few Allied fighter groups remaining in the Mediterranean Theater of Operations. The previous August the group had converted from P-39 to P-47 aircraft and, in the ensuing months, had compiled a combat record that was surpassed by few units anywhere in Europe.

Although Lt. Raymond Knight was destined to spend only a bit more than four months in combat, he would participate in 82 missions during that period, compiling a total of nearly 180 combat hours.

The majority of these missions were concentrated in the period which coincided with the final Allied drive to clear northern Italy. During these frenzied days he was awarded the Air Medal with five Oak Leaf clusters and was wounded twice.

Early in April, the 8th Army was slated to open the push by crossing the Senio and Santerno Rivers and drive toward the Argenta Gap and the city of Ferrara, southeast of Venice. Simultaneously, the 5th Army was to launch a coordinated blow against the enemy flank in the vicinity of Bologna, about 40 miles southeast of Ferrara.

Lt. Gen. John Cannon's Mediterranean Air Force was charged with lending air support to these combined operations. The primary aim was three-pronged—to sever the enemy's lines of communication, to deny him supplies, and to prevent his escape from the Allies.

To this latter end, major effort was concentrated on the destruction of the many bridges which spanned the Po River. Success would seal the Axis defenders in a death trap.

During the critical period, the busy fighter pilots hit troop strong points, gun emplacements, and similar targets by day. At night the light bombers smashed at road junctions and ammunition and supply dumps.

Despite this concentration and the resultant destruction, for the most part the German air units in the area chose to remain on the ground, out of the fight, preferring to wait for one final, all-out counterstrike if the Allies should attempt to leap the Po.

Within a week after the offensive was launched, the fate of Bologna was sealed. Meanwhile, the 8th's advance on Ferrara was moving almost apace, and the Germans were forced into a general withdrawal.

Suddenly, just west of Bologna, the 5th scored a major breakthrough, splitting the defending German armies and bringing them to the point of near panic. They bolted northward in a final effort to scramble across the Po.

Now, however, the superiority of the Allied air power became alarmingly evident to the Germans. Once they

SMSGT. HAL BAMFORD

LT. RAYMOND LARRY KNIGHT

...ng the scene of USAF's 43rd Medal of Honor feat.

reached the river crossings they were forced to rely on pontoon bridges and ferry boats, helpless targets before the fury of the aerial assault.

The Germans still chose to keep their remaining air strength grounded, but it was now evident that the moment was near when they must commit it.

On the morning of April 24, advance elements of both the 5th and 8th Armies crossed the Po. Knowing aerial counterattack was now inevitable, the limited force of U. S. fighters leaped at German airfields with a renewed vigor. At the very forefront stood Lieutenant Knight, who had become a first lieutenant a scant six weeks earlier.

The account of his brilliant two-day leadership and climactic and heroic death is stirringly told in the citation contained in War Department General Orders, published on September 24, 1945.

He piloted a fighter-bomber aircraft in a series of low-level strafing missions, destroying 14 grounded enemy aircraft and leading attacks which wrecked 10 others during a critical period of the Allied drive in Northern Italy. On the morning of 24 April, he volunteered to lead two other aircraft against the strongly defended enemy airdrome at Ghedi. Ordering his fellow pilots to remain aloft, he skimmed the ground through a deadly curtain of antiaircraft fire to reconnoiter the field, locating eight German aircraft hiding beneath heavy camouflage. He rejoined his flight, briefed them by radio, and then led them with consummate skill through the hail of enemy fire in a low-level attack, destroying five aircraft, while his flight accounted for two others. Returning to his base, he volunteered to lead three other aircraft in reconnaissance of Bergamo airfield, an enemy base near Ghedi and one known to be equally well defended. Again ordering his flight to remain out of range of antiaircraft fire, Lieutenant Knight flew through an exceptionally intense barrage, which heavily damaged his Thunderbolt *to observe the field at a minimum altitude. He discovered a squadron of enemy aircraft under heavy camouflage and led his flight to the assault. Returning alone after this strafing, he made 10 deliberate passes against the field despite being hit by antiaircraft fire twice more, destroying six fully loaded enemy twin-engine aircraft and a fighter plane. He then returned to his base in his seriously damaged plane. Early the next morning, when he again attacked Bergamo, he sighted an enemy plane on the runway. Again he led three other American pilots in a blistering low-level sweep through vicious antiaircraft fire that damaged his plane so severely that it was virtually nonflyable. Three of the remaining twin-engine aircraft at the base were destroyed. Realizing the critical need for aircraft in his unit, he declined to parachute to safety over friendly territory and unhesitatingly attempted to return his shattered plane to his home field. With great skill and strength, he flew homeward until caught by treacherous air conditions in the Apennines Mountains, where he crashed and was killed. The gallant action of Lieutenant Knight eliminated the German aircraft which were poised to wreak havoc on Allied forces pressing to establish the first firm bridgehead across the Po River. His fearless daring and voluntary self-sacrifice averted possible heavy casualties among ground forces and the resultant slowing of the German drive culminated in the collapse of enemy resistance in Italy.*

Lt. Raymond Larry Knight's Medal of Honor was the 43rd awarded to a member of the United States Air Force. It also represented the 38th and last to be earned by an American flyer in World War II.

The extent of the contribution he and his mates made to this victory in Italy can best be illustrated by the words of General von Senger, German commander in the area. "That [airpower] is what finished us. We could have withdrawn successfully with normal rear guard action despite other heavy pressures, but due to the destruction of the ferries and river crossings, we lost all our equipment. North of the river, we were no longer an army."

LIFE ON VENUS?

SOME ASTRONOMERS believe that life may exist on Venus, the target of a Soviet space station.

Appearing both as the Morning Star and the Evening Star, Venus is the brightest and most beguiling of planets, the National Geographic Society says. None other approaches Earth so closely—a mere 26,000,000 miles away. None other is so like our planet in size and density. Yet Venus remains tantalizingly mysterious, because clouds completely hide its surface.

What lies beneath the clouds? Astronomers speculate, but they do not know. Venus hides its secrets well, and relatively few facts about it have been gathered.

Jungles or Dustbowl?

Some astronomers have suggested that Venus may be covered by jungles of incredible density; others say that it is more likely a dustbowl. Some think an enormous ocean may totally envelop the planet, but disagree on whether the sea is water or petroleum. Some theorize that life exists on Venus; others discount the possibility. Some suggest life may once have subsisted but has now died out; others think it is just beginning.

The contradictory opinions arise from the difficulty of gathering data and the numerous interpretations to which the facts lend themselves.

Water vapor is a case in point. At the turn of the century, astronomers believed the Venusian clouds were composed of tiny droplets of water, like those on Earth. This belief supported the theory that life might exist on Venus, because all of Earth's living things require water.

In 1923, however, spectroscopists working at Mount Wilson Observatory in California failed to detect any water vapor whatsoever on Venus, and scientists began to think of it as a lifeless desert.

As time passed, scientists improved their tools and techniques. In 1959, Dr. John Strong of Johns Hopkins University succeeded in detecting some evidence of water vapor above the clouds of Venus by means of a balloon that lifted observers and instruments to 80,000 feet above much of Earth's obscuring atmosphere. Dr. Strong's finding revived the life-on-Venus theory.

Has Perpetual Fog

Scientists have also detected carbon dioxide in abundance and some oxygen. Thus Venus apparently has the chemicals needed for life as known on Earth, though possibly not in the proper quantities.

What about the climate? Readings from a supersensitive thermometer placed at the focus of a visual telescope indicate a temperature of about minus 40 degrees Fahrenheit above the clouds on Venus. Radio observation shows a temperature of 580 degrees Fahrenheit—368 degrees above the boiling point of water—at the planet's surface. Between the extremes may lie temperatures that living things could bear. But life would not be pleasant because of the perpetual pea-soup fog.

With or without life, Venus remains, in Homer's words, "the most beautiful star set in the sky." The ancients worshiped it; Polynesians paid homage with human sacrifices. Today the "Earth's Twin Sister" has again captured the human imagination as man, at long last, comes closer to discovering her secrets.

"Sure I Subscribe to The Airman . . .

It keeps me posted on what the rest of the Air Force is doing. I could get it in the day rooms, but each copy is meant for 10 readers so I make sure I'll always get a personal copy by subscribing. Besides, I like to send it to the folks when I'm finished with it."

Why Don't You Subscribe, Too?

NOTES FROM AN EARLIER PAGE

TWENTY YEARS OR SO AGO there were no ICBMs or supersonic interceptors in the inventory of airpower weapons. The electronic computer had not yet been invented, and when someone spoke of limitless space he was usually referring to Texas. But airmen were just as busy twenty years ago as they are today. The perspective was a bit different, and the proportions less extensive. Here is what was happening around the bases in June 1937, 24 years ago this month.

Then, as now, technological advances were making some skills obsolete and forcing people to retrain. At Mitchel Field, N. Y., it was announced in June 1937 that Control Tower Operators would henceforth take over the duties of Base Buglers. "By means of a phonograph with crystal pickup," said the announcement, "and two high-quality speakers, bugle calls of exceptional clarity and perfection are played." (The rumor that the same phonograph and same records are still in use is denied.)

PCS moves interrupted the peaceful routine of family life just as they do today. Capt. Nathan F. Twining at Fort Leavenworth, Kans., found himself on orders to San Antonio, Tex., in June 1937, and Flying Cadet Henry Viccellio left Kelly Field upon graduation from Advanced Flying School. PCS moves involving entire organizations were more common in those times than they are today. In June 1937 the 9th Airship Squadron was transferred from Scott Field, Ill., to Marshall Field, Fort Riley, Kans. And squadrons were smaller in those days. Total enlisted strength of the 9th Airship Squadron was 70 men, and 45 of these were privates.

Wright Field, Ohio, had a noise problem in 1937. The depot there was engaged in the business of overhauling and testing airplane engines, and local residents blamed the noise for everything from the weather to the hens not laying. The first shielded test stand was completed in June of that year. The base then proudly announced to the public that: "At a distance of some thousand yards, ordinary field noises of birds, crickets, wind, rustle of leaves, etc., drown out any torque-stand noises."

If lawyers in 1961 are concerned about international law in outer space, the question in 1937 was the effects of airpower on established legal codes. Dr. John H. Spencer of the U. S. Department of State spoke on the subject before the American Society of International Law at Washington, D. C. "Airplanes," he said, "have written a great question mark in the troubled skies of international law as well as modern warfare."

There were "characters" in uniform in the old days just as there are today. Away back in 1931 Private John B. Smith, Air Corps, was decorated for saving the life of a pilot in a burning aircraft. Private Smith next appeared in the news in June 1937 when his wife gave birth to a child. The news item noted that Private Smith was still a private and always referred to himself as "Hero" Smith.

The new Y1B-17 Boeing Bomber was the hottest topic of conversation among airmen in 1937. A flight of four of the new craft flew a routine introductory cruise over the industrial heart of the nation from Langley Field, Va., covering 15 states in 11 hours. Navigator on one of the aircraft was a 1st Lt. Curtis LeMay.

It was on June 1, 1937, that the body of Norman Prince, one of the founders of the famed Lafayette Escadrille, was placed in its final resting place at Washington Cathedral in the nation's capital.

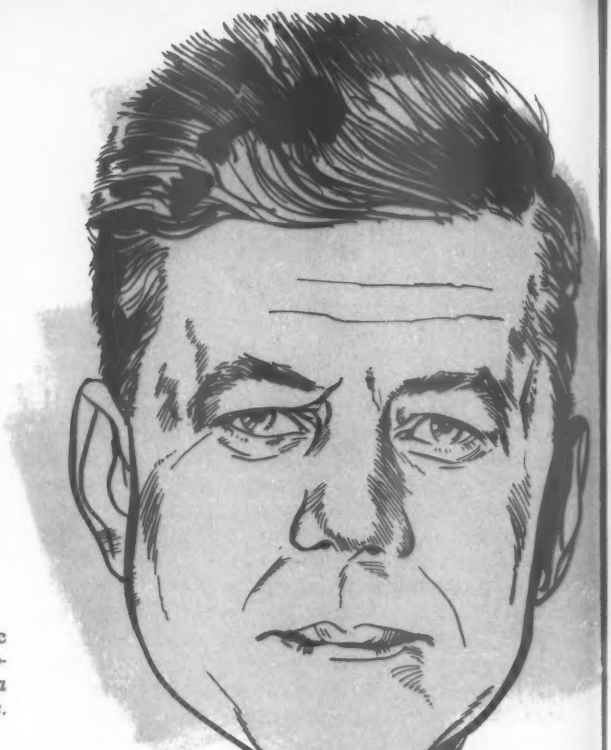
Prince, a native of Massachusetts, spent many pleasant holidays in France as a young man. When the war with Germany broke out in 1914, he determined to offer his services to the French forces. First he learned to fly at a school near Marblehead, Mass., before sailing for France to sign his enlistment papers. During his first weeks abroad he worked with tireless energy to interest French authorities in the idea of organizing a squadron of volunteer American airmen.

The idea eventually bore fruit and Prince flew as a combat pilot with the *Escadrille Americaine*. He was a brilliant airman, a courageous fighter, and an inspiration to his associates.

On October 12, 1916, he flew his last sortie, the day of the great raid on the Mauser works at Obendorf. Flying cover for the bombers, Prince shot down at least one German *Fokker* but, streaking for home in the darkness, he struck a high-tension electric cable and crashed. He died of his wounds three days later, and French authorities decorated him with the *Legion d'Honneur* on his deathbed. He already held the *Croix de Guerre* and the *Medialle Militaire*.

The French gave him a hero's funeral, but it was not until 1937 that he finally came home. Norman Prince now holds a place in airpower tradition, and the generations following can take pride in the story of his brilliant, if all too brief, career.

An Extract from the President's Special Message On the Defense Budget



The first section of this special message is entitled Basic Defense Policies. *Therefore, this section and the introductory passages of the message are presented here as a matter of vital interest to every member of the Air Force.*

IN MY ROLE AS Commander in Chief of the American Armed Forces, and with my concern over the security of this nation now and in the future, no single question of policy has concerned me more since entering upon these responsibilities than the adequacy of our present and planned military forces to accomplish our major national security objectives.

In January, while ordering certain immediately needed changes, I instructed the Secretary of Defense to reappraise our entire defense strategy, capacity, commitments and needs in the light of present and future dangers. The Secretary of State and others have been consulted in this reappraisal, and I have myself carefully reviewed their reports and advice.

Such a review is obviously a tremendous task and it still continues. But circumstances do not permit a postponement of all further action during the many additional months that a full reappraisal will require. Consequently we are now able to present the most urgent and obvious recommendations for inclusion in the fiscal 1962 Budget.

Meaningful defense budget decisions, however, are not possible without preliminary decisions on defense policy, reflecting both current strategic assumptions and certain fundamental principles. These basic policies or principles, as stated below, will constitute the essential guidelines and standards to be followed by all civilian and military personnel who work on behalf of our nation's security. The Budget which follows, if enacted by the Congress under its own solemn duty "to provide for the common defense," is designed to implement these assumptions as we now see them, and to chart a fresh, clear course for our security in a time of rising dangers and persistent hope.

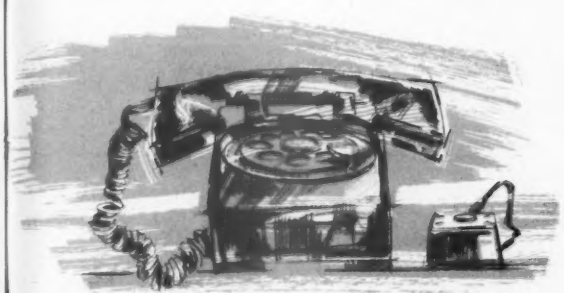
Basic Defense Policies

1. *The primary purpose of our arms is peace, not war*—to make certain that they will never have to be used—to deter all wars, general or limited, nuclear or conventional, large or small—to convince all potential aggressors that any attack would be futile—to provide backing for diplomatic settlement of disputes—to insure the adequacy of our bargaining power for an end to the arms race. The basic problems facing the world today are not susceptible to a military solution. Neither our strategy nor our psychology as a nation—and certainly not our economy—must become dependent upon the permanent maintenance of a large military establishment. Our military posture must be sufficiently flexible and under control to be consistent with our efforts to explore all possibilities and to take every step to lessen tensions, to obtain peaceful solutions and to secure arms limitations. *Diplomacy and defense are no longer distinct alternatives, one to be used where the other fails—both must complement each other.*

Disarmament, so difficult and so urgent, has been much discussed since 1945, but progress has not been made. Recrimination in such matters is seldom useful, and we for our part are determined to try again. In so doing, we note that, in the public position of both sides

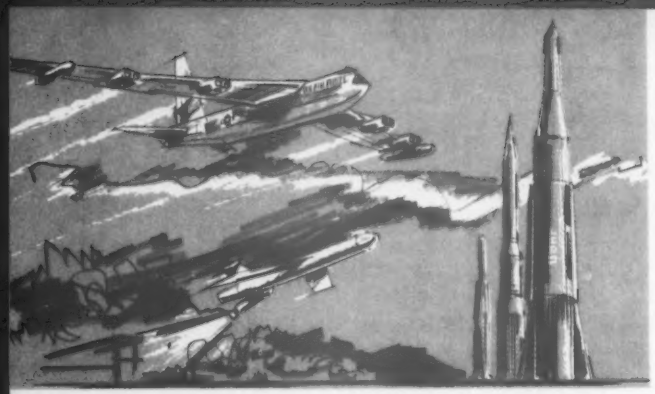
in recent years, the determination to be strong has been coupled with announced willingness to negotiate. For our part, we know there can be dialectical truth in such a position, and we shall do all we can to prove it in action. This budget is wholly consistent with our earnest desire for serious conversation with the other side on disarmament. If genuine progress is made, then as tension is reduced, so will be our arms.

2. *Our arms will never be used to strike the first blow in any attack.* This is not a confession of weakness but a statement of strength. It is our national tradition. We must offset whatever advantage this may appear to hand an aggressor by so increasing the capability of our forces to respond swiftly and effectively to any aggressive move as to convince any would-be aggressor that such a movement would be too futile and costly to undertake. In the area of general war, this doctrine means that such capability must rest with that portion of our forces which would survive the initial attack. We are not creating forces for a first strike against any other nation. We shall never threaten, provoke or initiate aggression—but if aggression should come, our response will be swift and effective.



3. *Our arms must be adequate to meet our commitments and ensure our security, without being bound by arbitrary budget ceilings.* This nation can afford to be strong—it cannot afford to be weak. We shall do what is needed to make and to keep us strong. We must, of course, take advantage of every opportunity to reduce military outlays as a result of scientific or managerial progress, new strategic concepts, a more efficient, manageable and thus more effective defense establishment, or international agreements for the control and limitation of arms. But we must not shrink from additional costs where they are necessary. The additional $650 million in expenditures for fiscal 1962 which I am recommending today, while relatively small, are too urgent to be governed by a budget largely decided before our defense review had been completed. Indeed, in the long run the net effect of all the changes I am recommending will be to provide a more economical budget. But I cannot promise that in later years we need not be prepared to spend still more for what is indispensable. Much depends on the course followed by other nations. As a proportion of gross national product, as a share of our total Budget, and in comparison with our national effort in earlier times of war, this increase in Defense expenditures is still substantially below what our citizens have been willing and are now able to support as insurance on their security—insurance we hope is never needed—but insurance we must nevertheless purchase.

4. *Our arms must be subject to ultimate civilian control and command at all times, in war as well as peace.* The basic decisions on our participation in any conflict and our response to any threat—including all decisions relating to the use of nuclear weapons, or the escalation of a small war into a large one—will be made by the regularly constituted civilian authorities. This requires effective and protected organization, procedures, facilities and communication in the event of attack directed toward this objective, as well as defensive measures designed to insure thoughtful and selective decisions by the civilian authorities. This message and budget also reflect that basic principle. The Secretary of Defense and I have had the earnest counsel of our senior military advisers and many others—and in fact they support the great majority of the decisions reflected in this Budget. But I have not delegated to anyone else the responsibilities for decision which are imposed upon me by the Constitution.



5. *Our strategic arms and defenses must be adequate to deter any deliberate nuclear attack on the United States or our allies*—by making clear to any potential aggressor that sufficient retaliatory forces will be able to survive a first strike and penetrate his defenses in order to inflict unacceptable losses upon him. As I indicated in an address to the Senate some 31 months ago, this deterrence does not depend upon a simple comparison of missiles on hand before an attack. It has been publicly acknowledged for several years that this nation has not led the world in missile strength. Moreover, we will not strike first in any conflict. But what we have and must continue to have is the ability to survive a first blow and respond with devastating power. This deterrent power depends not only on the number of our missiles and bombers, but on their state of readiness, their ability to survive attack, and the flexibility and sureness with which we can control them to achieve our national purpose and strategic objectives.

6. *The strength and deployment of our forces in combination with those of our allies should be sufficiently powerful and mobile to prevent the steady erosion of the Free World through limited wars; and it is this role that should constitute the primary mission of our overseas forces.* Non-nuclear wars, and sub-limited or guerrilla warfare, have since 1945 constituted the most active and constant threat to Free World security. Those units of our forces which are stationed overseas, or designed to fight overseas, can be most usefully oriented toward deterring or confining those conflicts which do not justify and must not lead to a general nuclear attack. In the event of a major aggression that could not be repulsed by conventional forces, we must be prepared to take whatever action with whatever weapons are appropriate. But our objective now is to increase our ability to confine our response to non-nuclear weapons, and to lessen the incentive for any limited aggression by making clear what our response will accomplish. In most areas of the world, the main burden of local defense against overt attack, subversion and guerrilla warfare must rest on local populations and forces. But given the great likelihood and seriousness of this threat, we must be prepared to make a substantial contribution in the form of strong, highly mobile forces trained in this type of warfare, some of which must be deployed in forward areas, with a substantial airlift and sealift capacity and prestocked overseas bases.

7. *Our defense posture must be both flexible and determined.* Any potential aggressor contemplating an attack on any part of the Free World with any kind of weapons, conventional or nuclear, must know that our response will be suitable, selective, swift and effective. While he may be uncertain of its exact nature and location, there must be no uncertainty about our determination and capacity to take whatever steps are necessary to meet our obligations. We must be able to make deliberate choices in weapons and strategy, shift the tempo of our production and alter the direction of our forces to meet rapidly changing conditions or objectives at very short notice and under any circumstances. Our weapon systems must be usable in a manner permitting deliberation and discrimination as to timing, scope and targets in response to civilian authority; and our defenses must be secure against prolonged re-attack as well as a surprise first-strike. To purchase productive capacity and to initiate development programs that may never need to be used—as this Budget proposes—adopts an insurance policy of buying alternative future options.

8. *Our defense posture must be designed to reduce the danger of irrational or unpremeditated general war* —the danger of an unnecessary escalation of a small war into a large one, or of miscalculation or misinterpretation of an incident or enemy intention. Our diplomatic efforts to reach agreements on the prevention of surprise attack, an end to the spread of nuclear weapons—indeed all our efforts to end the arms race—are aimed at this objective. We shall strive for improved communication among all nations, to make clear our own intentions and resolution, and to prevent any nation from underestimating the response of any other, as has too often happened in the past. In addition our own military activities must be safeguarded against the possibility of inadvertent triggering incidents. But even more importantly, we must make certain that our retaliatory power does not rest on decisions made in ambiguous circumstances, or permit a catastrophic mistake.

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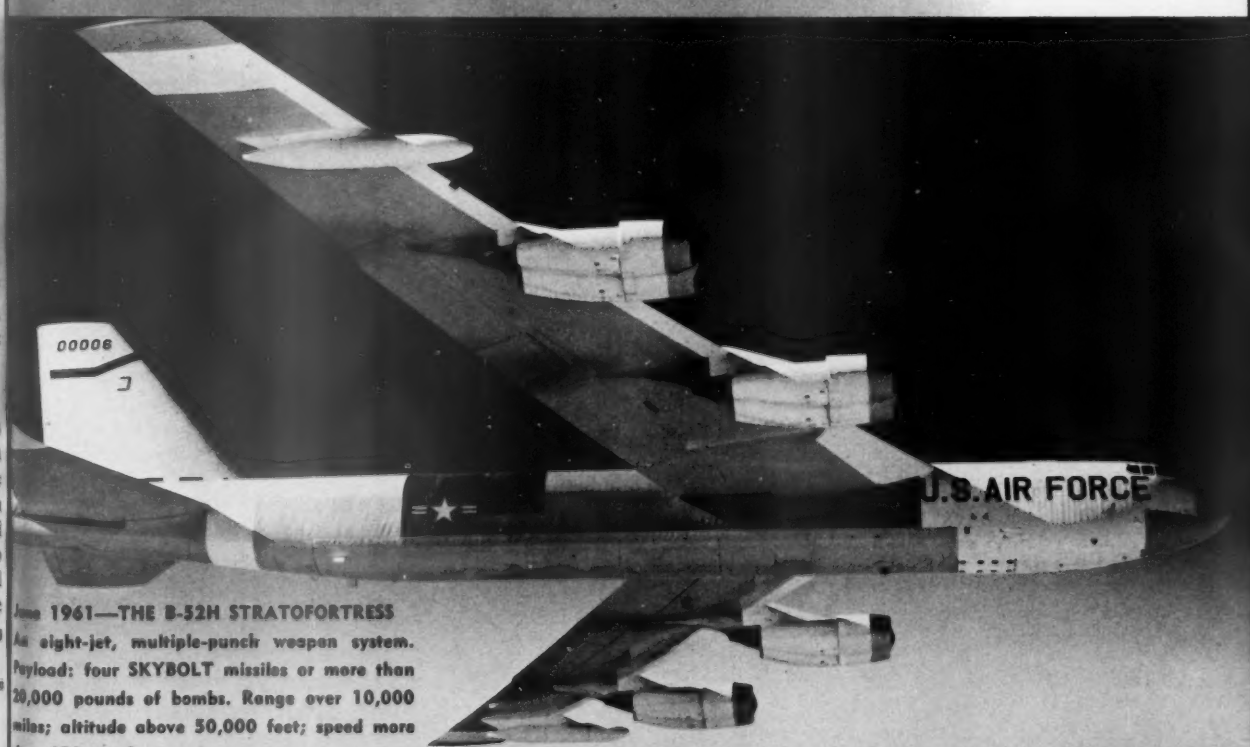
It would not be appropriate at this time or in this message to either boast of our strength or dwell upon our needs and dangers. It is sufficient to say that the budgetary recommendations which follow, together with other policy, organizational and related changes and studies now underway administratively, are designed to provide for an increased strength, flexibility and control in our defense establishment in accordance with the above policies.

THREE DECADES OF STRATEGIC BOMBERS

June 1941—THE B-17D FLYING FORTRESS
Backbone of strategic bombardment at the beginning of World War II; forerunner of the E, F and G models which eventually helped pulverize the Axis powers. Range of the B-17D: about 1,280 miles with 2,400 pounds of bombs. Altitude 30,000 feet; speed approximately 300 m.p.h.

June 1951—The B-36 PEACEMAKER
First intercontinental bomber and mainstay of U. S. deterrent strength for a decade, the PEACEMAKER never fired a shot in anger. Range was 10,000 miles with 10,000 pounds of bombs; altitude ceiling above 45,000 feet; speed more than 435 m.p.h.



June 1961—THE B-52H STRATOFORTRESS
An eight-jet, multiple-punch weapon system. Payload: four SKYBOLT missiles or more than 20,000 pounds of bombs. Range over 10,000 miles; altitude above 50,000 feet; speed more than 650 m.p.h.

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HOW FAR INTO SPACE?

"...as far as they need to go in regular operations."

GENERAL THOMAS D. WHITE
Chief of Staff, USAF